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IRON AND COAL
TRADES REVIEW

Vol. 180 March 11, 1960 No. 4,782

Satisfying the Coal Consumers

ADDRESSING the Coal Industry Society on Monday, Sir Norman Kipping suggested an approach to the chemical industry to develop a material which, sprayed on to boiler fuels, would make them dustproof. He had a second suggestion to make—a wetting agent which, for a trifling cost, would enable the ashes to be cleared from domestic grates "without smothering the rooms with fine dust."

The director-general of the Federation of British Industries may not have been wholly serious in putting forward these two proposals: he was addressing a luncheon meeting, and at luncheon meetings speakers delight to leaven the heavier portions of their discourses with a little light relief. They are suggestions which nevertheless warrant serious consideration by the coal industry and trade, not only because of any merit which they may have in themselves, but also because they are part of the wider question of "consumer satisfaction," to borrow an ugly, but expressive, piece of market research jargon.

The coal industry has not yet succeeded in satisfying all of its customers all of the time, and it is the customer who controls the volume of trade. The customer demands that his fuel be delivered in the right quantity, in the right quality, at the right time, and at what he considers the right price. Coal cannot always satisfy all these requirements, but sellers of competing fuels seem generally to fulfil them. Sir Norman Kipping was insistent that price is the prime factor in deciding whether the order goes to coal or, say, oil, but there are a lot of misconceptions in regard to the relative prices of coal and oil, and if the coal industry and trade could satisfy more fully the other three consumer requirements there would be much less talk of a changeover on the score of price alone.

Unlike so many coal critics—and many are in reality critics of the theory of nationalization rather than its practice and of the product itself—Sir Norman endeavoured to be constructive in his remarks. He noted the achievements of the National Coal Board in raising its efficiency, improving its productivity, the attention it was paying to coal preparation, and its success in keeping price levels stable for more than two years. He thought that these achievements should be more widely recognized and perhaps made the basis of the board's current efforts in the public relations field. But he was insistent that more could and should be done to secure greater consumer contentment with coal as a fuel.

In his remarks on the domestic trade one suspects that Sir Norman had in mind consumers in the cities and towns rather than in the country as a whole. There are hundreds of thousands of householders who are satisfied users of coal. They predominate in the Midlands and the north and in most country districts elsewhere. Dissatisfaction is most intense, or most vocal, in the south, and particularly in the towns, where there are big concentrations of population and where storage facilities are restricted. It was of these areas that Sir Norman was no doubt thinking when he spoke of "the householder suffering from protracted delays in delivery at a time when the producer was plagued with a surplus." This, unfortunately, does happen, and there is little profit in pointing out that delays often occur through no fault of the collieries or the merchants, who are not to blame, for example, for the annoying embargoes placed by the railways on coal traffic in recent weeks. Nor, perhaps, is there anything much to be gained by suggesting that whatever faults consumers may find or profess to find with coal, it provides a much more satisfactory way of heating the home than some oil appliances, judging by Government statements made in the last few days.

Sir Norman Kipping's strictures about dirt and smoke and delays in delivery are all part of the one problem of securing consumer contentment. It is not enough for the NCB to shrug off complaints about dirt and stone in coal and excessive slack content by counting the number of preparation plants laid down since the war and quoting the amount of money spent on them: consumers still have cause for complaint on these scores, especially in relation to boiler fuels. It is not enough for Coal Board and merchant to explain away delivery delays by pointing to the labour and transport difficulties with which they are afflicted, or to fob off complaints about excessive moisture in fuels by saying they cannot do anything about it.

The housewife asks for her coal to be delivered when she wants it and in the condition she wants it to be in, and is less and less inclined in these days, when financially, we are told, we have "never had it so good," to accept excuses, especially when she can secure an alternative fuel immediately by telephoning her oil merchant, or merely turning a

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tap or flicking a switch. In different ways, the industrial consumer takes the same point of view.

Somehow coal industry and trade have to provide a greater degree of customer satisfaction than is apparent at the moment. A contented customer is a good customer. If he cannot be made content with coal he will be a good customer for some other fuel.

NCB Chairman's Views on NUM Wage Claims

A FURTHER appeal to miners to consider the burden on the industry's finances which their claims for higher wages and a shorter working week would impose has been made by Sir James Bowman, chairman of the National Coal Board. At a meeting with the executive of the National Union of Mineworkers on Wednesday, Sir James pointed out that the total cost of the demands would be in the region of £90,000,000 a year.

Such an addition to the board's deficit, he emphasized would inevitably mean one of two things—either an increase in its borrowing powers or an increase in the price of coal. The first possibility was ruled out because the NCB's borrowing powers were raised only last month to an ultimate level of £750,000,000. As for a price increase, it could only lead to coal becoming less competitive with other fuels, and thus to more colliery closures and further redundancy.

The NUM claim was for a 12s. a week rise for some 300,000 day-wage men. Its representatives on Wednesday asked that the talks should be adjourned so that the executive could consider the board's statement. The executive met yesterday (Thursday).

WORKING HOURS OF YOUNG PERSONS AT COAL MINES

SECTION 127 of the Mines and Quarries Act, 1954, restricts the hours that may be worked by boys over 16 but under 18 years of age who are employed at mines and quarries. Section 129 exempts coal mines in Northumberland, Warwickshire, and Co. Durham from these restrictions until the Minister of Power appoints a day for the exemption to end.

This day is fixed for all three counties under the Coal Mines (Male Young Persons) Order, 1960 (SI No. 349), made by the Minister. The exemption will accordingly end in Warwickshire on March 31, and in Co. Durham and Northumberland on December 31.

Welsh Industrial Building Leads

INDUSTRIAL building approved per worker in Wales in the year ended March 31, 1959, was almost twice as great as in any other region, according to the first annual report of the Development Corporation of Wales published on Monday. The amount of 6.4 sq. ft. a worker in Wales, is a marked increase over the previous year (1.8 sq. ft. a worker).

This has been achieved because of the approval of plans for the new Spencer Works at Llanwern, near Newport, of Richard Thomas & Baldwins, Limited.

Steetley's Biggest-Ever Capital Programme

TWO major capital projects costing £3,675,000 are being undertaken by Steetley Company, Limited, manufacturers of refractories. Total group capital plans total £4,500,000 and constitute the biggest programme the company has ever faced.

The Hartlepool magnesia plant is to be further extended at a cost of £3,000,000 and a second tunnel kiln unit at Steetley, to make basic bricks containing magnesia, will cost £675,000.

The chairman, Mr. N. M. Peech, says that the order-book is now much better than it was at this time last year and he expects 1960 to be another satisfactory year. It has been reported that the principal customer, the steel industry, is expected to produce 24,000,000 tons in 1960 (4,000,000 tons more than last year) and holders might, therefore, expect a substantial increase in profits in the current year.

But Mr. Peech points out that despite the relatively low steel production last year, it was possible to sell the entire output of magnesia from the enlarged works. He says there is little scope for increased profits in that division of the business until new extensions are completed.

It is also inevitable, Mr. Peech goes on, for a little time to elapse before full production can be obtained from the new dolomite works at Whitwell, which will start operating in the second quarter. Profits in 1960, therefore, cannot be expected to rise in proportion to activity in the steel industry.

Guillebaud Report Warning

HOPE that no industry wou'd use the Guillebaud Report as a springboard for new wage demands was expressed by the Master Cutler, Mr. P. J. C. Bovill, at the annual dinner of the Yorkshire section of the Institute of Fuel in Sheffield on Monday. If that did happen, he said, everyone would be in the same position as they were before the report was issued and the "unfortunate railwaymen" would themselves be in no better position than they were now.

Mr. Bovill, who is managing director of Newton, Chambers & Company, Limited, Thorncliffe, near Sheffield, described the outlook as "bright" and the economy as "buoyant," provided an eye was kept on inflation.

INDIAN GOVERNMENT PLANS FOR STEEL AND COAL

TOTAL of Rs. 4,400,000 000 will be allocated by the Indian Government for private sector steel projects during the country's third five-year plan period, according to proposals being finalized by the Cabinet. This total includes Rs. 1,000,000,000 for a fourth steel plant at Bokaro.

Most of the materials and equipment for this plant will be made locally.

The proposals also include the allocation of Rs. 4,000,000,000 for oil and coal mines and a similar amount for stock accumulation.

Steel Hits Output Jackpot

FEBRUARY PRODUCTION RATE PASSES 25,000,000-TON MARK

STEEL production in February was at an annual rate of 25,073,000 tons. This is the first time in its history that the steel industry has passed the 25,000,000-ton mark in any month. It gives reasonable assurance that the industry's target of a total output in 1960 of 24,000,000 tons will be reached. Production of the steel industry as a whole is now running at the rate of 98 per cent. of capacity.

Passing of the 25,000,000-ton production rate last month is a significant event in the steel industry. It not only brings production to a new high level; it means also that the industry is now almost fully engaged.

To hit the year's target of 24,000,000 tons it was essential that the 25,000,000-ton rate be reached early in the year. Easter and Whitsun will cut the rate in the spring months of the year, and the annual holidays will intervene later.

Most departments of the steel industry are now working to capacity, though there are weak spots which keep the output rate slightly below 100 per cent. of capacity. Demand for plates and sections has risen, and these at one time doubtful sectors are now employing the plate and section mills fully. Sheets are scarce, and imports will be necessary throughout the year.

Among consuming industries, shipbuilding, the railways, and the coal and oil industries are the laggards, and the steel mills still await a recurrence of demand from these quarters.

Latest pig-iron and steel output figures (in tons), with the corresponding 1958 and 1959 returns, are shown in the following table:—

Period.	Pig-iron.		Steel ingots and castings.	
	Weekly average.	Annual rate.	Weekly average.	Annual rate.
1959—December ..	280,400	14,583,000	432,900	22,513,000
1960—January ..	297,500	15,470,000	471,400	24,511,000
February ..	301,500	15,680,000	482,200	25,073,000
1958—December ..	223,100	11,602,000	313,100	16,282,000
1959—January ..	228,700	11,894,000	356,900	18,560,000
February ..	221,800	11,536,000	347,400	18,065,000

Apprentices Warned: Pull Your Weight

WARNING to apprentices who were not pulling their weight was given by Mr. G. M. Baker, managing director of C. A. Parsons & Company, Limited, engineers, etc., of Newcastle-upon-Tyne. Mr. Baker, who was speaking at the company's annual prize-giving last week, said that some apprentices had done very well, but he did not think many of them were sufficiently informed about the true nature of the industry.

He went on: "You are engaged in a competitive industry and only the very highest standards will do. Failure to produce those standards will mean that the employment we can give you in future years will fall off."

Continental Steel Production

OUTPUT of steel in France last month was 1,417,000 tons. This was slightly higher than the January figure and almost the same as the record output of October, 1959. In West Germany, too, steel production continues to rise. Last month, output was 2,773,000 tons, compared with 2,771,000 tons in the previous and longer month. Output in the first two months of the year was almost 33 per cent. higher than in the same period of 1959.

West German steelworkers are now earning about 5s. 4d. an hour, according to figures issued from Cologne. Rates of pay in Luxembourg and Belgium were 21 per cent. and 8 per cent. higher, respectively, than this figure. However, the German pay was 29 per cent. higher than in Holland, 49 per cent. above French levels, and 54 per cent. higher than in Italy.

From Moscow comes news that Russia will produce about 65,000,000 tons of steel this year—5,000,000 tons more than last year's figure. During the year, about 10 new Siemens-Martin furnaces will be brought into operation.

East Germany is to buy refined steel and sheet iron from Britain worth about 2,000 000 Ostmarks (about £321,540). The deal was concluded at the Leipzig Spring Fair with the British steel stockholding and shearing firm of H. E. Samson, Limited, Southall (Middx), which represented seven major British steelworks.

Stewarts and Lloyds Closing Clyde Works

ABOUT 200 men will be affected by the closing by Stewarts and Lloyds, Limited, of its Clyde works, one of the company's three undertakings in Coatbridge (Lanarkshire). Alternative employment is being sought for the men in other Scottish works belonging to the firm, and in cases of direct redundancy financial compensation, based on length of service, will be considered.

It was stated that the only alternative to closing the 100-year-old works would be costly and extensive rebuilding.

SECRETARY of the Derbyshire Area of the National Union of Mineworkers, Mr. Bert Wynn, made his second television appearance in recent weeks on Sunday when he appeared in "ABC of the North" to explain his Area's plan for improving relations between the NUM and the public.

Passing Thoughts . . .

PRESTIGE does matter. If Britain is consistently absent from a fair at which other Governments are well represented, the visitors to that fair, some of whom may be influential people, will not conclude that we are absent because we are too sensible to waste our money. They are most likely to think that we are absent either because we are too poor to afford it, or because we have nothing worthwhile to show, or because we are just not interested in their market.—MR. F. J. ERROLL, Minister of State, Board of Trade.

The trade unions cannot allow their prestige and history of achievement to be ruined at the hands of nonentities. Even a coupon-filling democracy can understand and appreciate that such a calamity would be disastrous.—SIR WILLIAM LAWTHER, *former president of the National Union of Mineworkers and of the Trades Union Congress, in an article in the Nottingham Guardian Journal.*

There is . . . much too much facile pessimism about British coal exports. Though they face many political and artificial problems they can rely over a period on many commercial and natural advantages. Unfortunately wrong interpretation of the past can seriously hinder healthy policies for the future.—MR. JOHN A. RAVEN, director of the British Coal Exporters' Federation, in a letter to the Daily Telegraph.

It is not Polish coal that is reacting against the British miners, but foreign imported oil which is now being used as a substitute for coal.—MR. ABE MOFFATT, *president of the Scottish Area of the National Union of Mineworkers, in a letter to The Scotsman.*

We all work with the same aim in view: to prosper. It seems wrong to suggest that the interest of the man on the factory floor is in any way different from the interest of the director in the board room. Both of them, to the best of their ability, should be working for the success of their company.—From the annual report of the Universal Asbestos Manufacturing Company, Limited.

Even in this automated highly mechanized age a firm's greatest asset is its employees.—Comment in Ingot News, monthly newspaper of Richard Thomas & Baldwins, Limited.

It is easy to fill one's working hours with routine chores and convince oneself of one's indispensability—but this is not enough. Routine chores should be delegated and the time spent in, as it were, "cultivating the mind." Senior people must set aside periods during the week when they are "not available."—"The Older Director—His Limitations and Advantages," a booklet published by the Institute of Directors' medical research unit.

Many share with Viscount Ridley a sense of disappointment at the slow progress the authorities are making towards the economic conversion of coal to more acceptable fuel forms. Even so, nothing is happening or in prospect to alter the opinion that, possibly for 20 years, good use can be made of all the coal mined in this country.—Newcastle Journal.

Safety is bound up with tidiness and good housekeeping. If a place is untidy you can bet your bottom dollar it is also accident-prone. The saying "Where there's muck, there's brass" must have been coined by one of the old school who was trying to excuse himself for making a lot of money he was not entitled to by neglecting the safety of his workpeople.—MR. H. F. SPENCER, managing director of Richard Thomas & Baldwins, Limited.

Contrary to popular belief, the person most stirred by the humanitarian side of accident prevention is the head of an industrial concern, who sees the works as a whole and realises the potentiality for tragedy and harm.—MR. J. BROWN, *accident prevention officer, Stewarts and Lloyds, Limited, in an article in the Financial Times.*

You will still have cases where there is a strong technical and administrative argument, which may not excite people a great deal, for a change in the size of the unit of control in an industry, and from there to an argument for public ownership.—MR. HUGH GAITSKELL, Leader of the Opposition.

The State holdings in steel look like being higher in cash terms than under nationalization. It is reasonable to ask why and for how long they are needed.—The Times.

The cardinal principle should surely be that the benefits of productivity should be shared as and when they are achieved and not before.—MR. W. H. MCFADZEAN, president of the Federation of British Industries.

This is a world where little, if anything, is perfect.—MR. JOHN RODGERS, *Parliamentary Secretary to the Board of Trade.*

I do not think that anyone will underestimate the national love of the open fire.—MR. RICHARD WOOD, Minister of Power.

Four Ingredients for Ideal Labour Relations

FOUR ingredients which produce the ideal labour situation in a factory are given in the annual report of the Universal Asbestos Manufacturing Company, Limited. They are:—The employee must be paid a good day's wage for a good day's work; there must be a sense of responsibility based upon mutual respect; there must be good two-way communications; there must be fair, commonsense, and, above all, prompt handling of all labour matters.

The company, which was founded 28 years ago, has never had a labour dispute.

In his annual review, the chairman, Mr. F. W. R. Douglas, states that additional asbestos cement manufacturing plant installed at Watford is now fully employed in meeting orders which exceed present resources. The whole turnover of the group has grown and profits so far are higher than those of the corresponding period of the past financial year.

Group net profits were doubled from £151,933 to £313,800 in the year ended September 27, 1959, and the dividend is raised from 1s. to 1s. 6d. per 5s. share.

THE JAPANESE MINISTRY OF TRADE has approved the formation of a joint company for the production of coal-mining machinery by the Japanese steel company, Nitto Tekko Kaisha, and the Eisenhütte Westfalia ferrous-metals concerns at Lünen, West Germany. The company would be owned 51 per cent. by the Japanese and 49 per cent. by the German company. The plan has to be approved by the Japanese Commission for Oversea Investment.

Plain Speaking

SIR NORMAN KIPPING SUMS UP COAL INDUSTRY

WITHOUT abandoning the principles of the price structure, the National Coal Board should be prepared to offer special terms where the circumstances of a demand made a material contribution to the attainment of this ideal. This advice together with other objective and constructive criticisms of the industry was given by Sir Norman Kipping, director-general of the Federation of British Industries, speaking at the monthly luncheon of the Coal Industry Society in London on Monday.

The NCB's future seemed to him to be the same as that of any other industry in its ability to match its competitors, especially oil. The industry batted on a sticky wicket; for one thing all sorts of people had tried their hand at forecasting demand. Gladstone had a go in 1871. He had estimated rate of growth in consumption at about 3.5 per cent. per annum and anticipated an annual consumption of not less than 2,607,000,000 tons of coal at the end of a century!

The Ridley Committee had thought by now the total demand would have reached some 260,000,000 tons. The FBI was so unwise as to guess, in 1952, that by 1965 demand would reach 293,000,000 tons. It had now disposed of its crystal ball!

Greater Flexibility

In common with many other industries coal suffered from uncertainty of demand. It had had to give up the idea that the fall was temporary as it was now clear that the drive for lower costs in industry had itself led to more efficiency in the use of fuel. It was no use pretending difficulties did not exist—the industry must convince customers by price, service, and reliability.

Having outlined some of the features of the NCB's performance in 1958, Sir Norman suggested that they made a good story. It was an important part of sales promotion to spread the story of one's achievements and perhaps it would pay the board to concentrate on this task so that the country as a whole had more impression of a lively modern industry, on its toes to improve.

Markets were no longer taken for granted, but they would not be retained, still less won back, merely on the basis of more consistent quality and a free technical advisory service. "For one thing, coal is up against a competitor who offers both these things, plus a clean and smokeless product, and a price policy determined on a strictly commercial basis."

He did not minimize the threat of competition from oil and suggested the public must be left in no doubt that modern solid fuel appliances operated equally effectively and at lower cost and that supplies could be got when wanted.

If coal wished to retain or win back the industrial consumer it would have to show greater flexibility and adopt a more commercial approach.

Making his point about special terms where circumstances allowed, the speaker said that the value of any such offers would vary with the savings the board might make, but even if they were small, they might well be sufficient to influence a consumer in favour of coal. Mechanically-equipped depots represented a step in the right direction, but more was needed. "Something is wrong when the householder suffers from protracted delays in delivery at a time when the producer is plagued with a surplus," Sir Norman commented.

The NCB might seriously consider supplies of heat "on tap"—if only small boiler installations for houses in limited and densely populated districts. An experiment could be conducted by the NCB itself in a mining district.

He was afraid that under existing conditions there was little prospect of persuading those industrialists who had converted their steam-raising plants to oil to reconvert to coal. It would be wiser to concentrate on stemming the rate of conversion. The self-contained packaged oil-fired boiler was becoming increasingly popular in small plants and he was convinced the NCB should sponsor research into the development of a comparable coal-fired unit as a matter of urgency.

Two other ideas the speaker advanced for making coal more popular were the development of a coating material to make briquettes or "Phurnacite" clean to handle and a cheap spray to enable ashes from domestic grates to be cleared without covering the rooms with fine dust. "These are the sort of developments that will restore coal to popularity and prosperity," he declared.

Associated Engineering Expands in South Africa

NEW factory is to be built in Johannesburg for the Eugene Lauf & Lumenite Company, a subsidiary of Associated Engineering, Limited, Leamington Spa. This is the main feature of a South African expansion programme outlined last week by Mr. G. Colin Hepworth, managing director of the group's engine components' division.

Mr. Hepworth, who has just returned from a three-week visit to South Africa, said that personnel in the subsidiary company would be doubled to 500 over the next few years. Present production of pistons, pins, and cylinder liners would be extended to include piston rings for all types of engines.

A COURSE, designed primarily for executives and managers of local firms, has been arranged by King's College Department of Extra-Mural Studies, Newcastle-upon-Tyne, in conjunction with the European Coal and Steel Community. It will be held on March 19 and 20.

Mr. Maudling Sounds a Warning

DANGER that growing order-books and lengthening delivery dates might divert goods from exports to the home market was one of several warning notes sounded by Mr. Reginald Maudling, President of the Board of Trade, speaking at a meeting of Coventry Chamber of Commerce on Thursday of last week.

MR. R. MAUDLING

There were already signs that that might be happening on a small scale and he impressed on industrialists the need to continue to give full attention to export deliveries. "We have in the past suffered quite frequently from quoting longer delivery dates than our competitors and I very much hope that this will not start to happen again," he said.

Although it would be asking too much to expect another 10 per cent. increase in UK production, Mr. Maudling was confident that 1960 would see production rise still further, but, he said, there was very little slack now left in the economy and further increases in production must come from higher productivity and the growth of industrial efficiency.

"With scientific and technological development so vigorous, with skilful management, and with the current high rate of investment, such a continued expansion of production can be very substantial. It can also be combined with stable prices and with a further expansion of our exports. I can see nothing save our own folly that should prevent this happening. If we try and press ahead faster than our resources allow, then—and only then—is our progress likely to be in danger."

Turning to the balance of payments position, Mr. Maudling underlined the danger of the import bill growing faster than export earnings. The need to expand exports grew more, not less, he stated, and although there had been a vigorous rise in exports, those of some of Britain's competitors had been rising faster still.

"While world trade is buoyant there is room for all of us, but here is a clear warning of what might happen to us in an increasingly competitive world if the growth of world trade slackens off."

Offer for Redler Industries Declared Unconditional

OFFER by Cozens & Sutcliffe (Holdings), Limited, to purchase the ordinary shares in Redler Industries, Limited, has been declared unconditional. Acceptances have been received representing more than 75 per cent. of the Redler ordinary shares. The offer remains open until next Friday.

Cozens & Sutcliffe were bidding for Redler Industries in competition with Ley's Foundries & Engineering Company, Limited, whose offer later lapsed.

"Green" Labour for Spencer Steelworks

ERA of "fabulous wealth" would be brought to Monmouthshire by the new steelworks of Richard Thomas & Baldwins, Limited, now being built at Llanwern, said Mr. Henry F. Spencer, managing director of the company, last week. Mr. Spencer, who has given his name to the works, told parents and pupils of St. Julian's High School, Llanwern, that the works would become a "national monument in prosperity and efficiency."

He went on: "I prophesy that this magnificent plant will by its own vitality, originality, and sensitivity to the future technical changes in the iron and steel industry, stimulate an increasing demand for its products, necessitating progressive and continuing expansion."

Mr. W. O. Campbell Adamson, general manager of the new works, told members of the Newport and Monmouthshire branch of the British Institute of Management last week that most of the 5,500 men who would start work there next year would be inexperienced. "We would like as much of the labour as possible to be 'green'—inexperienced men without pre-conceived ideas," he said.

There would, however, be a small number of key-men from other plants, taken on in advance of the main labour force, which they would help to train. Mr. Campbell Adamson described the selection of the management team as "a nightmarish task." Although its members would all be experienced, they would not have worked in such a highly automatic plant before.

A new wage structure would have to be formulated for the men working there, he said. "We feel that the traditional structure has become somewhat distorted by the introduction of these large modern plants. We are seeking with the trade unions to agree on a structure more in line with the plant we are putting down."

Britain's Economy Can Obtain Increased Efficiency

ALL important sectors of Britain's economy could achieve a really substantial increase in productivity and efficiency, said Mr. W. H. McFadzean, chairman and managing director of British Insulated Callender's Cables, Limited, and president of the Federation of British Industries, in a speech at Reading last week. He warned that some prices might have to rise, but that these should be counteracted by others which must come down. Thus would room be made for those sections of industry and distribution where a price increase was justified and where rapid production rises were unlikely.

Mr. McFadzean said it was difficult, but necessary, to break two tendencies which had grown up with rising prices: the seeking of wage increases against an anticipated future increase in the cost of living, and the provision in profit margins of an undue allowance for possible, but not certain, future increases in costs.

It would be a pity to spoil things by failing to recognize that higher prosperity had to be earned before it could be enjoyed, Mr. McFadzean went on. The UK's external competitive power should be carefully watched, he said. As long as this was sound no great harm could happen to the country's economy.

In Parliament

LIQUID METHANE

Lord Mills Says Experiment Was Worthwhile

SECOND reading of the Coal Industry Bill which provides for an increase in the National Coal Board's borrowing powers from £650,000,000 to £750,000,000 was unopposed in the House of Lords on Thursday of last week. That did not prevent peers criticizing the industry and the Government's fuel policy. Replying to LORD STONHAM, LORD MILLS, Paymaster-General, gave a guarded reply on further imports of liquid methane and conveyed the impression that the experiment may be over—at least for the time being.

Moving the second reading, LORD MILLS said stocks now amounted to about 33,000,000 tons of coal and 5,000,000 tons of coke and were valued at £135,000,000. A large part of these stocks might remain on the board's hands for a number of years and there had been some alarm about the sufficiency of the allowance made in the board's accounts for the loss of value sustained by coal held in stock. The period of abnormal stock building was coming to an end and recent developments had not been discouraging.

It was understandable that the fall in consumption of coal since 1956 should have aroused acute anxiety, particularly among those with bitter experiences in the industry between the wars. But the current estimate showed there was no reason to think that the recent rate of fall would continue. Between now and 1965 there were quite favourable prospects of the expansion in the export trade.

Revised Coal Plan

The results of negotiations to alter, in favour of coal, the original contracts for converting certain power stations to oil firing were that the use of oil at power stations would be considerably reduced—compared with the original plan—by the equivalent of some 1,750,000 tons of coal this year and nearly 4,000,000 tons in 1965. The "Revised Plan for Coal" provided for an expenditure of £511,000,000 over the next six years, compared with £610,000,000 invested in the industry between 1954 and 1959. As a result the NCB hoped that 80 per cent. of the production would be coming from new and reconstructed collieries and there would be a marked increase in productivity. Since 1957 output per manshift had improved and it was hoped to get 30 to 31 cwt. by 1965.

LORD STONHAM thought it incredible that with our vast investment in coal the Government should allow liquid methane to be imported. LORD MILLS replied that there had been a number of trial shipments "and there the matter stands at present." It was an experiment that was worth carrying out, irrespective of whether or not eventually that form of fuel was going to be used or not.

LORD STONHAM: "Do you mean that for the time being there is no further intention of importing liquid methane gas?"

LORD MILLS: "Let me put it this way: there is no such proposal before the Government at this time."

VISCOUNT RIDLEY said it was wrong to force the use of coal if people wanted to use oil or gas or electricity, whether derived from coal or not. The best thing was to make the best possible use of native fuel resources rather than to bolster up the use of coal by artificial means which would, in the long run, be ineffective.

In future, said LORD HAWKE, coal would be piped to the consumer—either down a gas pipe or down a wire. Coal was by no means finished, but the pattern of distribution was quite changed and meanwhile the difficulty the Government faced of keeping the industry together and preventing the retreat becoming a demoralized rout was being dealt with in about the only possible way.

LORD BROCKET, who is a director of Midland Rexco, Limited, said his firm sent half its sales of smokeless fuels by road because it was cheaper for the retailer that way and because the railways were so inefficient that the retailers and the customers never knew when their fuel was going to be delivered.

The British Transport Commission, LORD MILLS replied, had had a considerable success in persuading the NCB that coal could be carried on certain routes and in certain places more economically than by road and the figures showed that the transport of coal by rail was going up.

More Money for Gas

MOVING the second reading of the Gas Bill on Tuesday, MR. RICHARD WOOD, Minister of Power, said that it raised the industry's borrowing limit from £450,000,000 to £525,000,000. The money was needed for capital development, which it was hoped would bring savings in production, storage, and distribution costs.

Mr. Wood said that as with solid fuel the Government's policy was based on freedom of choice. Since the gas industry suggested developments which would clearly increase its competitive power it was difficult to find grounds on which such a request should be refused.

Referring to schemes for a national gas grid, the Minister said that substantial economy might be made by basing the supply on large manufacturing units in the coalfields. The Gas Council had agreed to consult with the National Coal Board in planning any major gas-making project so that the possibility of basing it on coal would be fully considered. It had agreed that if the quantity of coal used in existing plant was

substantially reduced the longest possible warning would be given to the coal industry.

The Minister added that the Government had given no commitment to allow the import of methane on a commercial scale. It would not be done until proposals had been critically examined on grounds of commercial merit and raw material use in the industry. At present, the seventh and probably the last trial cargo was crossing the sea.

FINDING WORK FOR EX-MINERS

DESPITE what has been said elsewhere, miners are fully capable of undertaking other forms of work, said MR. JOHN RODGERS, Parliamentary Secretary to the Board of Trade, in reply to MR. WILLIAM STONES (Lab.). He said the board was doing what it could to encourage industrialists to establish factories, where a need for new jobs existed, whether for ex-miners or for others.

Mr. Stones said that ex-miners employed in a large steelworks and a ballbearings factory in his own constituency [Consett] had given complete satisfaction. He asked whether anything could be done to relieve the anxiety of people in the Durham coalfield where there was grave concern at the possibility of redundancy.

COAL TO SCANDINAVIA

QUESTION about the practical difficulties deterring the President of the Board of Trade from negotiating an agreement with Poland to enable British coal to be imported into Scandinavia on reasonable terms was asked by MR. JAMES BOYDEN (Lab.).

MR. F. J. ERROLL, Minister of State, Board of Trade, said that any agreement would be ineffectual unless it covered oil as well, and unless all important suppliers, including the US and Russia, became parties to it. Inter-Governmental agreements of this kind were not favoured by the Government, even if practicable.

IN A WRITTEN REPLY to Miss Margaret Herbison (Lab.), the Parliamentary Secretary to the Ministry of Power denied that the Minister had received a proposal to approve the installation of a low carbonization plant in the Central East Area of the Scottish Divisional Coal Board.

IN THE DEBATE on the report on the effect of draughts on the burning of portable drip-feed radiant oil heaters, Mr. Emanuel Shinwell (Lab.) suggested it would be an appropriate occasion to advise consumers to use gas, electricity, or even coal fires. He asked the Home Secretary to advise the Minister of Power on these lines.

IN WRITTEN ANSWERS to Mr. Gilbert Mitchison (Lab.), the Economic Secretary to the Treasury said that the Chancellor had not yet determined the rate of interest to accrue on any transfer of the loan to Colvilles, Limited. The Minister of Power stated that the only modification in the loan to Richard Thomas & Baldwins, Limited, for the Llanwern steelworks since details were given a year ago had been the raising of the maximum amount of the loan from £60,000,000 to £70,000,000 in order to enable the company to extend and accelerate the completion of the approved scheme.

MR. GORDON COULSON, outstanding tool-room apprentice for 1959 with C. A. Parsons & Company, Limited, engineers, etc., of Newcastle-upon-Tyne, has been awarded the company's Sir Claude Gibb memorial prize.

ECSC Coal Supplies

RUHR hard-coal producers have been told by the High Authority of the European Coal and Steel Community that the present marketing set-up for Ruhr coal can continue until April 30 of this year, a month longer than was originally foreseen.

An earlier request for a unified sales syndicate for Ruhr coal was unacceptable to the High Authority, and was withdrawn by its backers last week. It is clear that the Ruhr producers intend to lay before the Authority a request for a new marketing system. This new request is expected to envisage a sales syndicate for three years which would break up should stocks fall rapidly. The extra month in which the present sales set-up is to function will give the producers more time to consider their alternative plans.

The High Authority has not yet reached a decision on the question of whether the Belgian coal-marketing board (Cobéchar) should be allowed an extension of activity, or whether the country's coal sales organization should be remodelled, as in the case of Germany. A decision has now been outstanding for some 15 months, the Cobéchar licence having expired at the end of 1958. For an even longer period—some two years—the Authority has been waiting to take up negotiations with the French coal import body, Atic, on the question of its right to exist in its present form.

Hard-coal exports of ECSC countries in 1959 amounted to some 4,100,000 metric tons, or 230,000 tons more than in the previous year and standing against a record figure—in 1955—of 10,100,000 metric tons. While Federal Germany (excluding the Saar) raised her exports from 1,100,000 metric tons in 1958 to 2,820,000 tons last year, exports of the Belgian, French, and Dutch coal industries continued to fall.

Hard-coal imports into the ECSC countries fell by about 12,700,000 metric tons to a 1959 total of 19,160,000 metric tons. The fall was caused mainly by the cut in imports from the United States—by 11,800,000 to 14,000,000 metric tons.

MEM to Reduce Some Selling Prices

SELLING prices of certain lines are to be reduced by the Midland Electric Manufacturing Company, Limited, Birmingham. In his annual report, the chairman, Mr. W. J. Barber, says this move follows recent exhortations by the Government for industry to take a lead in the reduction of selling prices.

He goes on: "We have given very close study to the prices and profit margins of our range of electrical products. As a result of this examination and in an effort to play our part, it is our intention, shortly, to reduce prices on certain lines. This action will, of course, result in lower profits from our present turnover. Nevertheless, it is hoped that with a continuation of the present buoyant conditions we shall enjoy an increasingly larger share of the market so that the level of ultimate annual trading profits should be maintained and possibly increased, although the benefit of this expectation may not be felt immediately."

A final dividend of 8 per cent. is recommended, to make a total of 12 per cent. for the year, compared with 10 per cent. for 1958. After tax of £247,500 (£267,040), profit was £264,645 (£246,800).

A. & S. HENRY & COMPANY, LIMITED—Mr. G. O. Shelmerdine has been appointed a director.

Law Cases

PARALYZED MINER GETS £12,000

Condemned to Life of Misery

YOUNG miner who was paralyzed from the waist down in an accident at Barrow Colliery, near Barnsley, had been reduced to a wreck and would live the rest of his days in misery, said Mr. Justice Salmon at Sheffield Assizes. Awarding £12,000 damages to the miner, Mr. Henry Borrett (23), the judge commented: "He was a healthy young man at the time of the accident, engaged to be married . . . The marriage will not take place."

Mr. Borrett, who was crushed in a fall of stone from the colliery roof in May, 1957, alleged negligence and breaches of regulations by the National Coal Board. Special damages were agreed at £1,148. The board denied the allegations and alleged negligence by Mr. Borrett.

For Mr. Borrett, Mr. Stanley Price, QC, said that 15 minutes after starting work at the north face of the Lidgett Seam, the plaintiff was crushed by a fall of stone at a point where two props and a bar roof support were missing. The NCB claimed, he went on, that Mr. Borrett should have set a support in position before starting work. The men were working in cramped conditions at a face 2 ft. 9 in. high.

"A Curious Fact"

"Borrett was working towards the gap," Mr. Price continued, "but he could not set a support until he cleared the floor, and the accident happened before he could finish doing that." The missing bar and two props were eventually discovered in some waste material, but a curious fact was that the deputy's report form did not show that a bar was missing.

Mr. Borrett, who appeared in court in a wheel chair, said it was common to find bars or props missing after the machines had finished. If a bar was knocked out of position by a cutting machine, it was the cutterman's job to reset it. Mr. Borrett admitted he knew there was a bar missing before he went on the face.

Mr. A. B. Boyle, QC, for the NCB, alleged contributory negligence and said that Borrett should have set a support in position before starting work.

The judge found Mr. Borrett was one-third to blame for the accident. If it was a fact the bar was missing there was obvious danger and a sensible thing would have been to put a support into position immediately. Instead, Mr. Borrett went on with his normal routine. He said that on full liability, Mr. Borrett would have been awarded £18,000.

Petition to Revive Scottish Coal Company

AN attempt is to be made in the Edinburgh Court of Session to revive a coal-mining company which was liquidated under the nationalization of the industry. A petition, understood to be the first of its kind in Scotland, has been lodged by James McCreath, a chartered accountant, to restore Bairds & Dalmellington, Limited, Glasgow coal owners, to the register. The company was incorporated in 1929 with a nominal share capital of £1,750,000.

Between vesting date and February 4, 1955, the company received from the Ministry interest and revenue payments under the provisions of the Coal Industry Nationalization Act amounting to a total of £1,175,777. From these payments sums were deducted by the Ministry for income tax to the total amount of £535,779. The balance of £639,998 was distributed to the members of the company in the winding up.

Following a decision of the House of Lords in the case of Whitworth Park Coal Company, Limited (in liquidation) *v.* the Commissioners of Inland Revenue (1959), the petitioner now believes that the Ministry was not entitled to make the deductions and that the sums deducted are now recoverable. He believes that the amount deducted for tax was in excess of what the company was liable to pay and that a balance would remain for division among the members of the company.

He asks that the dissolution of the company be declared void and that the name of the company be restored to the register in order that the money may be recovered.

Lord Walker has ordered that the petition be served on the Lord Advocate and has allowed seven days for the lodging of answers.

BRIQUETTES THEFT

DRIVER employed by the National Coal Board was fined £2 at Burslem Stipendiary Court for stealing 88 lb. of coal briquettes, worth 8s., from a colliery near his home at Fegg Hayes (Staffs). The accused, Dennis Robert Taylor (33), pleaded Guilty.

Another man, Reginald James Filcock (35), was also fined £2 at the same court for stealing 20 lb. of coal worth 1s. 6d. from Norton Colliery. Filcock, who admitted the offence, was said to have told the security officer who caught him: "It's so dear to buy."

PLAINTIFF PARTLY TO BLAME

EX-MINER who lost his right arm and shoulder blade in an accident at Baads Colliery, West Calder, was awarded £6,048 damages by a jury sitting with Lord Cameron in the Court of Session. The plaintiff, Mr. James Dalziel Copland, who sued the National Coal Board for £10,500, said that while working as a miner he stumbled as he passed beneath

the terminal wheels of the haulage to collect an empty hutch. His hand came in contact with the moving haulage rope and was drawn between it and one of the wheels. Mr. Copland claimed that the board failed to maintain a safe system.

The board denied liability and maintained the accident was at least partly due to Mr. Copland's own fault. The jury unanimously found for the plaintiff and assessed damages at £8,064. By a majority of eight to four, they held the plaintiff 25 per cent. to blame.

NO MORE ROCK'N'ROLL

DAMAGES of £1,000, plus £29 11s. 3d. special damages—were awarded at Sheffield Assizes to Mr. Arthur Sargeant (19), of Barnsley, whose left ankle was badly injured in an accident at work. Awarding damages against Mr. Sargeant's employers, Qualters & Smith Bros., Limited, engineers, of Barnsley, Mr. Justice Stevenson said the plaintiff's social life had been somewhat marred because the pleasures of rock'n'roll were no longer available to him.

The judge said that Mr. Sargeant had been told to climb over a stack of castings while doing his work for the firm. One, which was dislodged, fell on his leg. There was medical evidence that Mr. Sargeant's ankle would probably have to be fused in the future to relieve him from pain. This would cause him difficulty if he tried to run or play games.

SEQUEL TO BRICKWORKS ACCIDENT

FOR contravention of the Factories Act in having no guard for a set of revolving knives at its Blairadam Brickworks, Kelty (Fife), the National Coal Board was fined £10 at Dunfermline Sheriff Court. On behalf of the board a plea of Guilty was entered.

Mr. G. A. Gordon, Inspector of Factories, said the standard of compliance with the Act was very high at the brickworks and he had had the utmost co-operation and assistance in investigating an accident in which an employee was injured by one of the knives.

It was stated that the NCB ordered the machine in 1951 with safety guards. The works had been inspected several times since, but the fact that a guard was missing had never been pointed out.

Mr. SYDNEY GREATBATCH (52) was awarded £437 10s. against his former employers, Daniel Doncaster & Sons, Limited, at Sheffield Assizes. Following an injury when a steel plate slipped he lost his thumb.

A CLAIM for £100 damages against Richard Thomas & Baldwins, Limited, by an employee, Mr. John Hugh Mitchell, failed at Tredegar County Court. The claim was brought following an accident to Mr. Mitchell three years ago which contracted a little finger of one hand. Judge Rowe Harding said he found no evidence of any negligence on the part of the company.

MR. JUSTICE SALMON at Sheffield Assizes dismissed a claim for damages brought against the National Coal Board by Mr. Frederick James Bowdin. Mr. Bowdin maintained that the NCB was responsible for an accident in which he was involved in January, 1956, when he slipped on a patch of ice at Thurcroft Main Colliery. He said the place was not properly lit and no measures had been taken to counteract the icy conditions.

Opposition Amendments on Strip Mill Loans Bill

INDICATIONS that Labour will object to the granting of Government loans for the building of new strip mills in Wales and Scotland unless a Government-nominated director is on the board of the assisted company are contained in Opposition amendments to the Iron and Steel (Financial Provisions) Bill.

The Bill would enable the Minister of Power to make loans from the Consolidated Fund of £70,000,000 to Richard Thomas & Baldwins, Limited, for its new plant at Llanwern, near Newport (Mon), and £50,000,000 to Colvilles, Limited, for the new plant at Ravenscraig, Scotland.

One amendment proposes that the loans should not be made unless there is a provision that after the advance of public funds, the State shall have an equitable share of the profits made by the companies. The Opposition also proposes that the loans should not be made "if the borrower is a company of which any shares are not held by or on behalf of a public authority, and if the security does not take the form of a debenture of the company, convertible into ordinary shares of the company at the option of the Minister . . . on such conditions and at such time as the Minister, with the consent of the Treasury, may consider right and equitable."

Another amendment proposes that the interest should be at a fixed rate equal to that applying to loans advanced from local authorities from the Local Loans Fund, plus interest at a special rate fixed in relation to the dividends fixed by a company in which shares are not held by or on behalf of a public authority.

Thomas Tilling's New Acquisitions

INDUSTRIAL holding company of Thomas Tilling, Limited, has announced acquisitions costing £1,250,000, mainly for quarries. Through a subsidiary company, Alexandra Building Services, Limited, of Glasgow, Thomas Tilling has acquired certain of the Scottish assets of Keir & Cawder, Limited, of Glasgow, comprising quarries, sand and gravel pits, mineral rights, brickworks and vehicles, by the purchase of that company's subsidiary, Houston Quarry Company, Limited.

Another Thomas Tilling subsidiary, Lime-Sand Mortar, Limited, of Knaresborough (Yorks), has bought other assets of Keir & Cawder. Alexandra Building Services has also bought a 75 per cent. interest in Slater & Company (Limestone), Limited, a company operating quarries from Thornton-le-Dale (Yorks).

Blacksmiths and Boilermakers Plan to Merge Unions

NATIONAL executives of the Boilermakers' Society and the Associated Blacksmiths', Forge, and Smithy Workers' Society, have accepted proposals for an amalgamation. Discussion first began in 1951, but no agreements were reached then and negotiations were resumed about 14 months ago.

The terms of the merger must first be approved by ballot by the 95,000 boilermakers and the 11,000 blacksmiths.

Application of Self-advancing Supports at Newstead Colliery

By H. COOPER, A.M.I.Min.E.

The installation of a newly developed self-advancing support system in a highly mechanized face at Newstead Colliery, East Midlands Division, National Coal Board, is described in this article. An account is given of the trials carried out to study the load characteristics and the behaviour of the hydraulic medium. The face is working in line with the cleavage planes and difficult roof conditions were encountered. Roof control was established with the aid of the new supports, which has an intensifying feature to enable setting loads per unit to be varied between 20 and 100 tons. Hydraulically loaded cantilever bars, another feature of the new support, were also found to be an asset in controlling the newly exposed roof.

EXTENSION of coal-face mechanization and the more rapid rate of face advance have rendered it increasingly difficult to maintain effective roof support by conventional-type props and bars, necessitating the introduction of a more easily manœuvrable and flexible form of support. The system which most adequately meets this new requirement, is a hydraulic self-advancing unit, which can be moved forward in line with the speed of coal extraction, without the need for manhandling.

An installation of this type, supplied by W. E. & F. Dobson, Limited, is in operation at a face in the High Main seam at Newstead Colliery in the East Midlands Division of the National Coal Board. The seam varies in thickness between 48 and 50 in. and is overlain by a bed of laminated shale which is very friable. The floor is of medium strength mudstone, with occasional soft patches subject to lifting. Fig. 1 shows a shaft section of the strata surrounding the High Main seam.

The seam is normally worked with the faces laid out at right angles to the coal cleavage, when roof conditions are reasonably good, but when opening up a new area in the South District, it was decided to work the South No. 4 face on "bord," or in line with the cleavage planes, to give a considerably longer face life than would have been possible with the face on "end."

Initial Support System

The new face, equipped with a 70-h.p. BJ-D Magnamatic shearer loader, fitted with a 44-in. segmented drum and driven by a water-cooled motor, was made 265 yd. in length and working commenced in May, 1958. The initial roof support system consisted of standard triangular link bars and hydraulic props. The wastes were supported by 6-ft. wide intermediate packs with 10-yd. wastes and two rigid chocks in each waste area.

In order to support the friable roof the 44-in. shearing drum was used, leaving a coal roof 6 to 8 in. thick. In the first few weeks of working a number of natural slips, running at angles varying from 90 deg. to almost parallel with the face, were encountered.

The working of the face was so impeded by falls that in August, 1958, it was decided to dispense with the link bars and hydraulic supports in favour of Dobson "Double Two" self-advancing supports, and systematic caving of the waste.

Self-advancing Supports

As the name implies, each "Double Two" support unit comprises two sections, the master and the slave, with two legs to each section which are mounted 2 ft. 3 in. and 2 ft. 7 in. apart, respectively, in 15-in. wide bases of robust construction, ensuring stability of the supports and

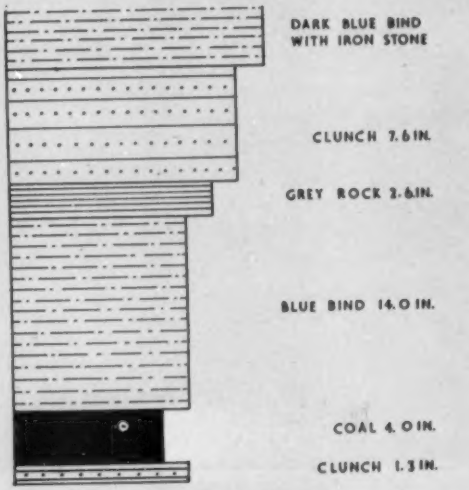


FIG. 1.—SHAFT SECTION OF HIGH MAIN SEAM AT NEWSTEAD.

transmitting low pressures to the floor of 170 lb./sq. in., at the full yield load of the support unit.

The hydraulic legs rest in a frame mounted on the base members of the master and slave sections and are located by a spigot on the bottom of each leg. The upper part of each leg is attached to the roof bars or canopies by means of a semi-spherical joint, which allows limited side-to-side movement, so that the bars can conform to uneven roof contours. The legs are flexible vertically within the restrictions offered by a rubber buffer mounted in the top of the frame.

Roof canopies fitted to the master and slave sections are of fabricated trapezoidal sections, with the widest edge up to the roof. Pivoted from the front end of the canopy is a cantilever bar, actuated by a hydraulic capsule, which holds the bar in contact with the roof with an effective upward thrust of 3½ tons at 40 in. from the pivotal point over the front leg, giving effective support to the roof over the conveyor track. The articulation of the cantilever bar is limited to 6½ deg. above and below the horizontal, and this range of movement is generally sufficient to cover uneven contours and ensure definite contact with the roof.

A feature of the hydraulic system is the means by which the setting pressure can be intensified to ensure that the newly advanced section can be initially loaded to ensure contact with the natural floor, affording immediate resistance to roof movement, and greater control of the nether roof. The intensifying system is applied to the support members of each section of the unit, *i.e.*, the front leg, rear leg and the hydraulic cantilever bar.

The pressure necessary to intensify the normal setting load of 1,000 lb./sq. in. line pressure (or 5 tons per leg) to 4,500 lb./sq. in. (or 25 tons per leg) is obtained by back feeding a hydraulic supply line to the top of the front leg. By applying this pressure to a small cylinder of reduced area, the pressure in the main cylinder of the ram is increased. This increased pressure is also fed to the back leg and the capsule of the hydraulic bar. The setting load of each section of the supports is controlled from a four-positional control valve, fitted to both the master and slave sections. The operating lever, which actuates the release, setting and intensifying valves, rotates a simple cam shaft to operate the various valves.

A fourth valve maintains the pressure in the support sections in the event of pump failure or hose damage, resulting in the loss of pressure in the feed lines. There is also a manually operated stop valve on each unit, which may be closed in order to isolate individual units from the feed and return mains when repair is necessary, and this in no way interferes with the remaining supports.

Conveyor push rams are fitted to the slave section of every sixth unit and are only extended during the actual operation of moving the conveyor forward, so that the support system is entirely independent of the conveyor, leaving an unimpeded travelling road between the conveyor and supports. Forward movement of the support unit and operation of the conveyor ram are controlled by separate disc valves mounted on the side of the advancing units (Fig. 2).

The hydraulic medium for the "Double Two" system is comprised of water and soluble oil and is circulated by two 9-gal./min. pumps at a supply-line pressure of 1,000 lb./sq. in. The number of support units on the face is 150 and two pumps, one in the supply gate and one in the main gate, each supply 75 units.

FIG. 2.—VIEW OF SOUTH 4's FACE. THE CONTROL VALVES CAN BE SEEN ON THE FRONT OF EACH UNIT.

Operation of the Chocks

The master section of the unit provides the anchorage and controls the movement of the slave section.

In operation the units are in the position indicated in Fig. 3. As the first strip is being sheared the slave section is released from the roof, advanced, and reset behind the shearer as it passes along the face. The canopies are set to the roof with the valve in the setting position to a load of 5 tons per leg from a line pressure of 1,000 lb./sq. in. The control is then moved into the intensifying position and the load increased to the required pressure, up to a maximum of 25 tons per leg.

The valve is then set in the neutral position and the slave sections remain stationary until the shearer starts its ploughing

run. The conveyor is then moved forward, and as ploughing is completed the master sections are advanced, set and intensified in readiness for the next shear.

Additional rams are fitted to assist in moving over the drive head of the conveyor, when the shearer is in the stable. Self-advancing chocks are also included in the hydraulic circuit to give additional support to the sides of the roadhead at the main and supply-gate rips.

Load Characteristics

Although the support unit (master and slave sections) is capable of being loaded to offer a maximum resistance of 100 tons to the movement of the roof, the intensifying systems allow the setting load to be varied so that the whole unit can be loaded with a minimum of 20 tons from line pressure. Thus setting loads of 5 to 25 tons per leg can be used to suit the existing nature of the roof. During the installation period at Newstead, comparatively light setting loads were initially applied to prevent further crushing of the tender roof, but as conditions were improved, the setting loads were increased until the maximum load could be applied.

Since this was the first installation of this type of support, trials were carried out which included a study of the load characteristics. Fig. 4 is a typical graph showing the load characteristics, from which it can be seen that the support quickly accepts and maintains the full load of 100 tons per whole unit until the sections are released. Measurements were obtained by means of a load recording meter incorporated in the hydraulic circuit, and the yield by convergence recorders fixed between the roof and the floor. Both the master and the slave were each found to yield at 50 tons and reset at between 46- and 48-ton loads.

The hydraulically loaded cantilever was found to be a definite asset, as it gave positive support to the newly exposed roof and made unnecessary the practice of packing over the bars at the back of the support to make contact with the roof over the conveyor.

The supports were found to yield about every four hours during the night-shift period when work was being undertaken on the rips only. Each release of pressure represents a yield of about $\frac{1}{16}$ in., producing a total yield of about $\frac{1}{4}$ in. during the standing period. During the two coal-producing shifts the units were not set long enough to produce a natural yield.

The hydraulic layout of the support system is such that the front and back legs and the cantilever ram are on one circuit. In one or two isolated sections of the face, where the roof was particularly friable, the waste tended to cave over the back legs, but this did not affect the stability of the units. Four or five of the units were modified, so that the front and back legs were isolated, with the object of avoiding the possibility of losing support effectiveness.

Experience has indicated that greater subsidence, illustrated in Fig. 5, over the waste edge occurs with this arrangement; accordingly the original common circuit has been maintained.

Installation in the High Main Seam

Supports were installed between the packs, in South No. 4 face, High Main Seam, starting from the supply-gate end on the night shift, coal production continuing on the day and afternoon shifts. Each night, five supports were installed, this being equivalent to the support of one waste length. A No. 1 Pikrose haulage was installed in the middle of the face to facilitate the installation. The units were hauled up to the Pikrose haulage from the

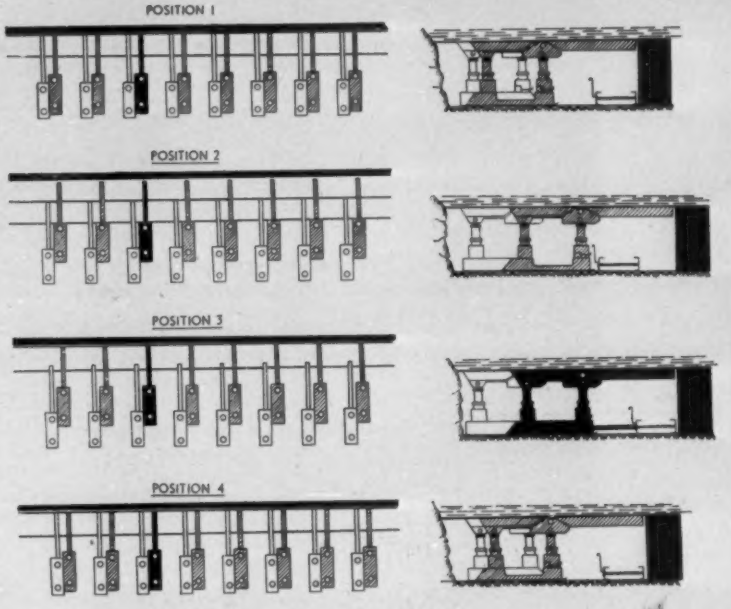

POSITION 1
POSITION 2
POSITION 3
POSITION 4
SEQUENCE OF OPERATIONS
POSITION 1. FACE PREPARED FOR SHEARING
POSITION 2. SHEAR TAKEN OFF AND SLAVE UNIT ADVANCED
POSITION 3. SHEAR COMPLETED CONVEYOR MOVED OVER AFTER PLOUGHING BACK
POSITION 4. MASTER UNIT ADVANCED AND FACE READY FOR NEXT SHEAR
KEY
MASTER
SLAVE
RAM SLAVE

FIG. 3.—OPERATION OF THE "DOUBLE TWO" SELF-ADVANCING SUPPORT.

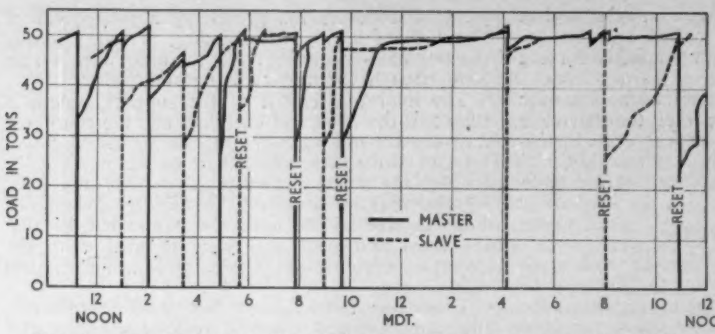


FIG. 4.—COMBINED LOAD CHARACTERISTICS OF MASTER AND SLAVE UNITS.

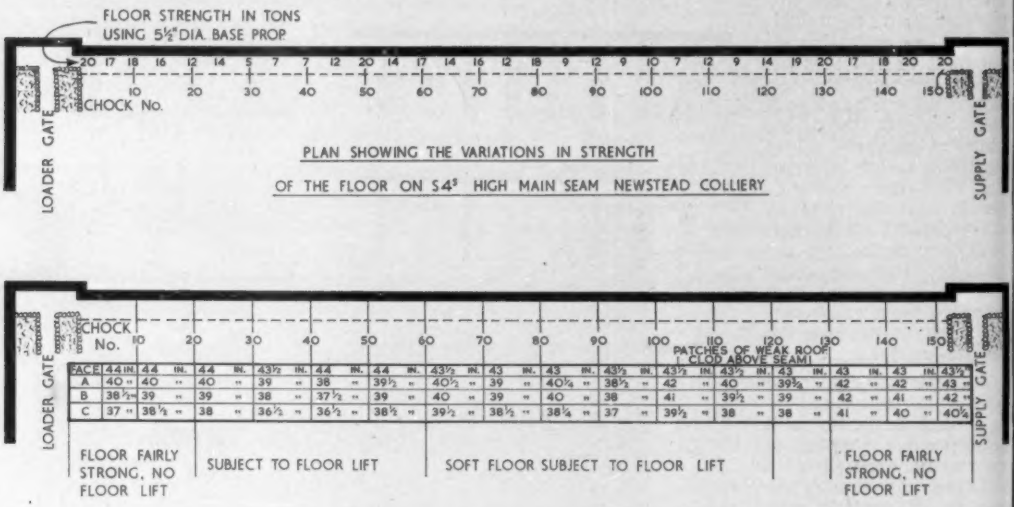
supply gate, and when the middle of the face was reached the units were transported along the main gate and the other half of the face completed.

The face was fully fitted up by the first week in December, 1958, and caving was then started, the number of units on the face being 150 spaced at 4-ft. 6-in. centres.

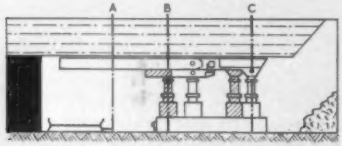
It was soon apparent that convergence had been reduced considerably, although "weights," mainly caused by the changeover from strip packing to caving, were experienced. On faces in the same seam worked on "bord" great difficulty was experienced due to bad roof conditions. With the installation of self-advancing supports, it has been possible to adopt caving of the waste and obtain good roof conditions.

From the onset of the installation in August to a few days prior to the Christmas holidays, little or no difficulty in roof control was experienced. A few days before the holidays the seam section thinned in the middle of the face for about 40 yd., resulting in a reduction in the thickness of top coal. Coupled with this thinning of coal, there was a number of natural slips and the two effects resulted in a breakdown of the roof in the area of the newly exposed roof behind the machine.

In the fall area, it could be seen that the immediate roof over the seam was very weak shale or clod, varying in thickness from 6 in. to 2 ft., which was found to part freely from the upper strata. Roof bolting and various methods were tried to


FLOOR STRENGTH IN TONS
USING 5½" DIA. BASE PROP
20 17 18 16 12 14 5 7 7 12 20 14 17 14 16 12 18 9 12 9 10 7 12 9 14 19 20 17 18 20 20
CHOCK No.
10 20 30 40 50 60 70 80 90 100 110 120 130 140 150
LOADER GATE
SUPPLY GATE
PLAN SHOWING THE VARIATIONS IN STRENGTH
OF THE FLOOR ON S4S HIGH MAIN SEAM NEWSTEAD COLLIERY
CHOCK No.
PATCHES OF WEAK ROOF (CLOD ABOVE SEAM)
FLOOR FAIRLY STRONG, NO FLOOR LIFT
SUBJECT TO FLOOR LIFT
SOFT FLOOR SUBJECT TO FLOOR LIFT
FLOOR FAIRLY STRONG, NO FLOOR LIFT

FACE	44 IN.	44 IN.	44 IN.	43½ IN.	44 IN.	44 IN.	43½ IN.	43 IN.	43 IN.	43½ IN.	43½ IN.	43½ IN.	43 IN.	43 IN.	43 IN.	43½ IN.
A	40 "	40 "	40 "	39 "	38 "	39½ "	40½ "	39 "	40¾ "	38½ "	42 "	40 "	39⅝ "	42 "	42 "	43 "
B	38½ "	39 "	39 "	38 "	37½ "	39 "	40 "	39 "	40 "	38 "	41 "	39½ "	39 "	42 "	41 "	42 "
C	37 "	38½ "	38 "	36½ "	36½ "	38½ "	39½ "	38½ "	38¼ "	37 "	39½ "	38 "	38 "	41 "	40 "	40¾ "



PLAN TO SHOW HEIGHT MEASUREMENTS
FROM FACE TO WASTES EDGES
THROUGHOUT THE LENGTH OF FACE

FIG. 5.—SURVEY OF FLOOR STRENGTH AND HEIGHT MEASUREMENTS IN THE HIGH MAIN SEAM.

V 180 MR 11 60 UMI

secure this clod, but with little or no success. Finally, the coal in the fall area was hand-filled in advance of the line of face and normal working was resumed in approximately three weeks.

Since this large fall there have been patches of broken ground on the face, the chief cause being the variation in the seam thickness resulting in the machine cutting through the coal roof. Although these minor falls have slowed down production due to extra precautions having been taken with the machine and supports, they have not stopped the face from turning coal.

Line-pressure Survey

The hydraulic units are operated on a closed circuit system with a ¾-in. dia. supply line and ½-in. dia. return hose. During the trials referred to earlier, it was found that when more than one support was being operated, or a number of push/pull rams were being used, the movements were very sluggish, and, in fact, the pressure in the return was so high that it would not permit the supports to be lowered sufficiently to allow them to be drawn forward. From these observations, a series of tests were carried out on the supply and return lines and the amount of fluid required to operate the system.

Pressure tests on the supply line with the pump positioned 60 yd. from the face showed that the flow pressure dropped from 1,000 lb./sq. in. at the pump to 420 lb./sq. in. at the face. Tests on the return hose when operating one support gave readings of between 50-57 lb./sq. in. at the middle of the face 150 yd. from the pump. It was concluded that when the pressure in the return line exceeded 60 lb./sq. in., the supports would not lower off sufficiently to allow them to be drawn forward and the resistance to the passage of fluid was caused by the small bore hoses.

This problem has been solved by fitting ¾-in. dia. feed hoses and 1-in. dia. return lines, the larger hoses being fitted to the spill-plates at intervals with T-pieces connected to the existing system. The manufacturers have remedied this defect and larger diameter hoses are being fitted to later installations. The face has now settled down to producing about 900 ton/day on two shifts and with an o.m.s. between 310 and 320 cwt., the face crew consisting of a total of 20 per shift. Both the main- and supply-gate rips are worked on two shifts to keep pace with the rapidly advancing face. The loader gate rip is manned with a crew of four and the supply gate rip with three, making a total of 14 rippers for the two shifts.

In setting up the face wage agreement, the installation was run for a month, during which time method study was applied. Using method study as a guide, the norm of 451 yd. was agreed, which included the work of preparing the stables. During this period the maximum cutting speed was established as 8 ft./min., giving a cutting time for the whole face of 118 min. The ploughing or flitting operation takes 42 min., which gave a total time of 160 min. for the completed 20-in. strip.

The author wishes to thank Mr. F. D. Severn, general manager, Area No. 4, East Midlands Divisional Coal Board, for permission to publish this paper, Mr. J. S. Fletcher, agent/manager of Newstead Colliery, and his staff for their assistance, and W. E. & F. Dobson, Limited, for its technical co-operation.

Methane Drainage in the Barnsley Seam

METHANE drainage is a well-established practice, but fundamental investigation is necessary so that its potentialities and limitations can be properly understood. In a paper entitled, "Methane Drainage in the Barnsley Seam of South Yorkshire, with Particular Reference to Investigations at Maltby Colliery," given to the Midland Institute of Mining Engineers, the authors, E. White and A. Wright, describe its introduction to the Barnsley Seam of south Yorkshire where, because of the risk of spontaneous combustion and the physical characteristics peculiar to this seam, it was thought necessary to make a special study.

Many of the mines working this seam are large and a drainage scheme requires careful planning and control. These arrangements in respect of Maltby are described in some detail. Because of the risk of spontaneous combustion a special study has been made of waste conditions as indicated by gas samples and temperatures. This, a long-term investigation, is as yet incomplete, but it has been established that, with proper sampling and control, spontaneous heating is not likely to result from drainage. The authors illustrate the improved environmental conditions resulting from drainage and describe the procedure agreed with HM Divisional Inspector of Mines where it is desired to introduce the use of electricity.

BS for Protection During Welding

FOLLOWING the recent publication of BS 679, "Filters for Use During Welding," the British Standards Institution has now issued a revision of BS 1542. Thus two associated standards dealing with head protection against welding radiation are now brought completely up-to-date.

BS 1542 takes account of the new welding processes requiring greater protection than previously found necessary and it recommends equipment for use with classified types of welding. Requirements for quality of workmanship and finish for spectacles, goggles, masks, and helmets are specified, and there are tests for flammability, strength of spectacle frames, and for corrosion resistance.

Copies of the new Standard may be obtained from the BSI, 2, Park Street, London, W.1, price 5s.

MINING MAGAZINE, 1959, is now available from the Sheffield University Mining Society, St. George's Square, Sheffield 1 (price 6s., post free). The publication includes the following papers:—"Underground Gasification in the USSR," by W. M. Noble: "Method Study in the Mining Industry," by J. N. Booth; "Absorption of Methane on Coal and its Release in a Mine," by W. Maas; "Hydraulic Transport of Coal," by A. Wright; "A Study of Glare Discomfort and Disability from Miners' Cap Lamps," by A. Graham Neill, and "Possible Applications of Nuclear Energy —Mining," by L. J. Parkinson.

Chicago Conference on Direct Reduction

ENGINEERS and scientists in many countries are interested in the possibilities of alternative methods of producing iron. Several direct reduction techniques have been evolved with varying degrees of success, and research continues on a very extensive scale.

While the blast furnace is a remarkably efficient method of making iron, it has certain limitations. Construction involves heavy capital charges; operation has to be maintained for long campaigns, output levels being variable only within certain limits; furthermore, the process involves the consumption of large quantities of high-grade metallurgical coke, expensive in itself and representing additional handling costs.

Direct reduction would appear to go some way towards overcoming these limitations. On the whole, the necessary plant is much less monolithic; operation can be interrupted and restarted with relative ease, introducing a hitherto unattainable degree of flexibility in production planning, and coke of lower quality and/or less volume is employed. Theoretically, at least, the economics of direct reduction would appear to present interesting possibilities.

The international conference on direct reduction organized by the Electro-chemical Society of the US at Chicago from May 2 to 5 should, therefore, arouse considerable interest. Some 21 papers are scheduled, reviewing progress in Canada, the United States, Great Britain, Sweden, France, Germany, and Norway.

Details of the programme and information on the arrangements are obtainable from Dr. R. R. Rogers. Mines Branch, Department of Mines and Technical Surveys, 552, Booth Street, Ottawa, Canada.

Technical Surveys Reduce Accidents

NATION-WIDE planned maintenance surveys, designed to prevent industrial accidents through using worn or obsolete welding and cutting equipment, are being carried out on an increasing scale by British Industrial Gases, Limited. For many years this free service has been conducted by highly trained technicians covering all regions of the United Kingdom. All oxy-fuel gas equipment in use in many major industrial undertakings, as well as in small factories and workshops, is examined.

Reports are made on the condition of the equipment and its operational efficiency. Technicians also advise on how to obtain greater operating efficiency from the equipment, with a minimum of wastage and a reduction in manufacturing costs.

Wiggin Nickel Alloys on Show

An exhibition called "Wiggin Nickel Alloys in Industry," is to be held by Henry Wiggin & Company, Limited, London, S.W.1, at Park Lane House, London, W.1, from March 21 to 25. The aim of the exhibition is to help engineers and designers to make the best use of the specialized alloys manufactured by the company. During the exhibition a series of lectures will be given on subjects including the fabrication of high-nickel alloys, and a series on the uses of high-nickel and nickel-base alloys in the production of nuclear power, in heat-resisting applications, in the electrical and electronic industries, and in chemical engineering.

Gas Turbine Engine for Ore Haulage

DELIVERY of a regenerative gas turbine engine to be installed in a truck for hauling ore at the company's open-cast mine in the Sudbury District of Ontario has been taken by the International Nickel Company of Canada, Limited. This is claimed to be the first occasion that a gas turbine engine has been subjected to the severe requirements of ore hauling.

Manufactured by the Allison Division of General Motors Corporation, US, the 225-h.p. GMT-305 Whirlfire, is a multi-fuel engine producing approximately 70 per cent. more power per lb. than a comparable piston engine per unit volume.

The turbine-powered truck will have to travel almost two miles over a winding road at a gradient of approximately 1 in 12 towing a load of 32 tons of ore. The engine is also ideally suited to the climate in the Sudbury District, where the temperature is often sub-zero.

Its low oil consumption and multi-fuel capabilities make it economical to operate, optimum fuel economy being realized at full power.

Publications Received

THE following publications which have recently been received are acknowledged with thanks.

DORMAN LONG & COMPANY, LIMITED, Middlesbrough —"Dorman Long Illustrated, 1959," December. STEWARTS AND LLOYDS, LIMITED, London, W.1—"Review News," December. ENGLISH ELECTRIC COMPANY, LIMITED, Stafford—"English Electric Journal," Vol. 16, No. 3. WEST'S GAS IMPROVEMENT COMPANY, LIMITED, Manchester—"West's Magazine," Vol. 31, No. 3. SAMUEL FOX & COMPANY, LIMITED, nr. Sheffield —"Fox Magazine," Winter. APPLEBY-FRODINGHAM STEEL COMPANY, Scunthorpe (Lincs)—"Appleby-Frodingham News," Christmas. W. C. HOLMES & COMPANY, LIMITED, Huddersfield—"Turnbridge News," Winter.

UNITED STATES STEEL CORPORATION, New York—"US Steel Quarterly," Vol. 13, No. 4. WILD-BARFIELD ELECTRIC FURNACES, LIMITED, Watford (Herts)—"Heat-Treatment Journal," December. JOHNSON, MATTHEY & COMPANY, LIMITED, London, E.C.1—"Platinum Metals Review," January. METROPOLITAN-VICKERS ELECTRICAL COMPANY, LIMITED, Manchester—"Gazette," No. 484. WAILES DOVE BITUMASTIC, LIMITED, Hebburn (Co. Durham)—"Protector," Winter. INSTITUTION OF MECHANICAL ENGINEERS, London, S.W.1—"Chartered Mechanical Engineer," January. EDGAR ALLEN & COMPANY, LIMITED, Sheffield—"Edgar Allen News," January.

RICHARDSONS WESTGARTH & COMPANY, LIMITED, Wallsend—"The Link," Winter. STANTON IRONWORKS COMPANY, LIMITED, nr. Nottingham—"Stantonian," December. C. A. PARSONS & COMPANY, LIMITED, Newcastle-upon-Tyne—"Heaton Works Journal," Christmas. INSTITUTION OF MINING ENGINEERS, London, S.W.1—"Transactions," January. SOUTH AFRICAN INSTITUTE OF MINING AND METALLURGY, Johannesburg—"Journal," December. MOND NICKEL COMPANY, LIMITED, London, S.W.1—"Inco-Mond Magazine," No. 12. RICHARD THOMAS & BALDWINS, LIMITED, London, W.1—"Ingot News," January. NATIONAL COAL BOARD, London, S.W.1—"Outlook," Winter.

V 1 8 0 M R 1 1 6 0 UMI

Arresting Flames in Gas Mains

FLAME arrestors should be fitted wherever there may exist an appreciable volume of explosive mixture which may be ignited by the passage of flame back through the connecting pipe system. Long ducts and pipes full of combustible matter are liable to give rise to more violent explosion than are compact spaces.

An arrestor, which is the subject of Report No. 696/58 of the Industrial Gas Development Committee of the Gas Council, from information supplied by the West Midlands Gas Board, has been specifically designed for the protection of plant using theoretical mixtures of town gas and air. The unit has been tested and found adequate to deal with detonation conditions set up in long lengths of mixture pipe.

Five sizes of flame arrestor, for pipe diameters of 1 in., 1¼ in., 1½ in., 2 in., and 3 in. have been designed. The constructional details are shown in Fig. 1.

The element consists of a pad of 12 circles of copper gauze, 60 meshes to the linear inch, clamped between two perforated baffle plates. These components are accommodated in a removable housing, being retained in position by a spacing ring and a suitable perforated retaining plate which also serves as a deflector plate. The outer casing is of malleable cast iron or cast aluminium alloy in two identical castings bolted together with the element housing in between.

Resistance to Detonation

Tests were carried out on a 1½-in. B.S.P. size unit and refer only to town gas/air mixtures in theoretical proportions. The town gas used is not specified except as regards its calorific value which was 450 BThU/cub. ft. and sp. gr. of approximately 0.5, requiring approximately 3.75 cub. ft. of air/cub. ft. of gas.

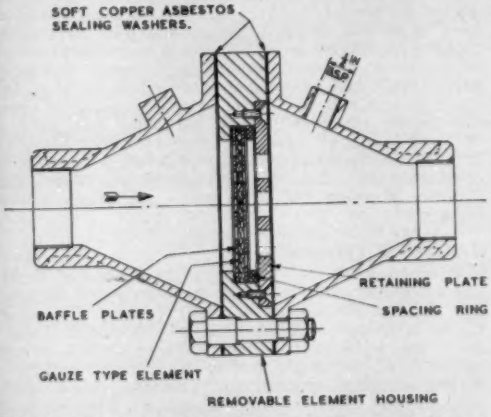


FIG. 1.—CONSTRUCTIONAL DETAILS OF FLAME ARRESTOR.

In the tests, a quantity of theoretical mixture was fed continuously from a conventional inspirator connected by hose to a short length of pipe on the inlet side of the flame trap. This pipe was fitted with a cellophane observation window. On the outlet side of the trap a 30-ft. length of pipe and alternatively a 60-ft. length terminated in a suitable cast-iron burner nozzle with a refractory tunnel. At a distance of 1 ft. from the burner head, a sparking plug was inserted into the mixture pipe. When flow conditions had been stabilized the mixture was fired to give detonation in the pipe. Velocities recorded by photographic means were of the order of 1,800 m/sec.

Observations were maintained on the inlet side of the trap to ascertain by flash and by bursting of the window whether the explosion had passed through the trap. The results of the tests are shown in Table 1.

TABLE 1.—*Results of Detonation Tests on Flame Arresters.*

Gas rate, cub. ft./hr.	Air rate, cub. ft./hr.	Length of pipe, ft.	Number of trials.	Results.
332	1,250	30	3	No failure
349	1,310	30	1	" "
308	1,160	60	2	" "
338	1,270	60	1	" "
316	1,190	60	8	" "
316	1,190	60	1	Failure

After these tests the element was taken out for examination. The baffle plates were found to be bent and some of the retaining screws loose. The element was reconditioned and given six further tests without failure.

Further work on flame arrestors is now being carried out at the Midlands Research Station of the Gas Council at Solihull, with a view to obtaining more data regarding performance of various types of elements.

FBI REGISTER OF MANUFACTURERS

LISTS of the products and services of over 7,500 member firms, under more than 5,400 alphabetical headings, are contained in the FBI Register of British Manufacturers, 1960, published for the Federation of British Industries by Kelly's Directories, Limited, and Iliffe & Sons, Limited.

In addition to the classified buyers' guide, there are seven other sections, giving addresses of companies, and information about trade associations, proprietary names, trade marks, etc. The French, German, and Spanish glossaries give translations of every product term used in the main buyers' guide, each being numbered for easy reference between the English headings and their translations.

The FBI register is compiled by the publishers in close collaboration with the Federation of British Industries. Containing 1,164 pages, it is obtainable for 42s., post free.

BOOK REVIEWS

Kempe's Engineers Year Book, 1960. Edited by C. E. Prockter. London: Morgan Bros. (Publishers), Limited, 29, Essex Street, Strand, W.C.2. 2 vols. 87s. 6d.

PRACTICALLY all engineers of standing are familiar with and recognize the great value of this Year Book with its numerous chapters covering almost every branch of engineering. The 1960 edition recently published, like its predecessors, has been carefully revised and brought up to date, certain chapters having been entirely re-written.

These include those dealing with "Electronic Engineering" and "Nuclear Power" which replace the previous chapter on "Atomic Power," "Pre-stressed Concrete," and certain chapters covering railway equipment; also alterations and additions due to the issue of new and revised British Standards. Additions have been made in connection with high-temperature steels in the chapter on "Iron and Steel"; that on "Machine Tools" now covers ceramic-tipped cutting tools, and tube-bending machines; "High-pressure Flow Meters" and "Fatigue Testing Machines" are included in the chapter on "Flow Metering and Mechanical Testing."

NCB coal classification tables form a useful addition to information on fuels. The comprehensive index contains more than 17,000 entries, providing ready reference to a remarkably wide range of subjects in which engineers, generally, are interested.

Data Sheets on Moulding Sands. Sheffield: British Steel Castings Research Association, East Bank Road. 30s. (post free).

THE data sheets on moulding sands included in this, the second revised and enlarged edition of this book, are the result of the first systematic attempt made so far in this country to present in a clear and convenient manner the large volume of information on this subject. The sources and properties of no less than 45 sands, both British and Continental, suitable for moulding purposes in steelfoundry work, are presented on each data sheet, the necessary information having been obtained from tests carried out by the association, members of BSCRA, sand suppliers, and the Refractories Department of Sheffield University.

Type, source, and supplier of each sand is clearly stated and the chemical and mechanical analyses are set out in tabular form. The grain shape and refractoriness are indicated, and a graph, showing the cumulative grading curves, is reproduced in each case. In addition, graphs showing the bonding properties appear on a number of these data sheets.

The value of this publication is enhanced by an introduction, which contains a concise survey of the types and occurrence of sands in Britain, as well as explanatory notes relating to the data sheets. A map of the distribution of foundry sands in this country, and a plate showing photo-micrographs of typical steelfoundry sands are also included.

Pocket Calendar for Mine Officials of Collieries 1960. By Proempeler, Hobrecker, and Epping. Düsseldorf western Germany: Published by K. Marklein, 500 p. (German text).

FOLLOWING the precedent of previous editions, this new issue is confined to West German colliery practice and contains chapters on allied sciences, mining engineering fundamentals, mining engineering techniques and mine rescue, mining economics, training for mine personnel, mining laws and regulations, an index of governmental mining departments and mining schools, a summary of textbooks and periodicals on mining, and a classified buyers' register.

The editors have presented only a few revised chapters of the listed items and devoted more space to selected topics. Of the subjects related to mining, the partly re-written section on chemistry occupies most space. Detailed information is given on support and various types of control of support in drifts and stopes. Mine haulage is described and illustrated by a number of diagrams.

Data on world coal production, coal production of western Germany, import and export, stockpiles, labour, wages, costs and efficiency are presented, and entire chapters listed in the general index, *viz.*, theory of materials, electricity, geology, mineralogy, mine surveying, shaft sinking, deep drilling, electric installations, mine rescue, etc., are omitted and referred to previous volumes. Thus to make proper use of the calendar nine out of the 10 previous issues are needed.

The only material contained in the calendar referring to any other country is found in the summary of standards of measures and weights relating to Great Britain. There is, apart from an incorrect figure, a wrong statement of their general use. The calendar provides no new source of information and is largely to be taken as a digest of material already published elsewhere.

Town and Country Planning Act, 1959. By T. J. Nardecchia and David Sullivan. London: Royal Institution of Chartered Surveyors, 12, Great George Street, S.W.1. 45s.

IMPORTANT changes in law made by the Town and Country Planning Act, 1959, which came into force on August 16, are described in this work, which sets out to relate them to existing law on the subjects affected. The authors have considered the needs of those concerned in the practical application of the Act and related statutes. To this end, the book is divided into two parts.

Part 1 covers 10 chapters of narrative, the first five of which are devoted to the changes in the basis of assessment of compensation for compulsory purchase. The next four chapters deal with the four remaining parts of the Act, the tenth being devoted to a discussion of practical problems.

The second part of the book is devoted to reproducing the text of the Act, each section being followed by a short and simple headnote and then by a comprehensive set of legal notes on the interpretation of the words and phrases used, with details of appropriate cases and other references. This part of the book is designed for those who are concerned with the precise interpretation of particular sections.

Combination of these two parts, together with the regulations reproduced in the appendices, provide a comprehensive work of reference on the Town and Country Planning Act, 1959, within the covers of one book.

Training in Ultrasonics

In response to many requests, the School of Welding Technology Committee of the Institute of Welding has decided to provide facilities for training those to be entrusted with the use of ultrasonics equipment for weld examination. Three British manufacturers of ultrasonic testing equipment, namely:—Kelvin Hughes (Industries), Limited; Solus-Schall, Limited, and Ultrasonoscope Company, Limited, have provided equipment and specialists for the practical work.

Metallurgical Coke Quality

BLENDING EXPERIMENTS WITH DURHAM COALS

The effect of blending non-coking, low-volatile coals and coke breeze with various Durham coking coals has recently been investigated by means of experiments in a 500-lb. test oven. The results are given by Dr. D. A. Hall and J. Gordon in a paper presented on February 25 to the Northern Section of the Coke Oven Managers' Association at Durham. Extracts from the paper appear below.

THE experimental oven was built to the same basic design as that of the Midland Coke Research Committee. The oven chamber is 3 ft. long, 3 ft. high and has parallel sides 18 in. apart. The normal weight of charge is 500 lb. of coal when it is crushed to pass 80 per cent. through ¼-in. mesh.

The chamber is heated by a series of 12 down burners in vertical flues, six in either side, the products of combustion from each side pass to sole flues below the vertical flues, from which they pass to a common flue to the waste gas flue of the main coke oven battery. There are controllable fireclay dampers at the base of each flue and in the main flue. The oven is heated by rich coke oven gas fed through a pressure regulator to give 2 in. w.g. pressure on the outlet. Normally at a flue temperature of 1,160 deg. C., a charge of coal containing 10 per cent. moisture, is carbonized in 17½ hr. and the consumption of gas of 520 BThU/cub. ft. is 500 cub. ft./hr.

In the testing of coal, a sample is taken from each charge and examined for size grading, moisture content and chemical properties. On any simple coal or blend at least two charges are carbonized and there is sufficient coke produced to carry out size analysis on 4-, 3-, 2-, 1½-, 1- and ½-in. sq. standard sieves, three shatter tests, 2 BS abrasion drum tests.

Addition of Low-volatile Coal

A series of experiments in the test oven were designed to answer the following specific questions:—

(*a*) Are the non-caking properties of a coal the main factor, or is the improvement in coke connected with the degree of devolatalization? This may decide whether it is necessary to produce just non-caking coal (volatile matter less than 23 per cent.) for blending, or whether the actual volatile content of the coal must be controlled; practical mining problems will be less difficult if the former is the case. (*b*) What is the effect of adding various quantities of low volatile coal and what is the optimum quantity to use? (*c*) What is the effect of the parent coal? Will the effect be different when using different rank coals, which vary in Durham Division from 301 to 502.

In order to test these various factors four main coals of different rank were chosen and were blended with various quantities of two low-volatile coals having approximately 20 and 14 per cent. volatile matter. The analysis of the coals used during the investigation is given in Table 1.

The physical characteristics of the cokes produced from the various parent coals and blend show that the mean size steadily increased as low volatile coal was added, and that this increase was greater the lower the volatile matter of the low-volatile coal. The increase in the +4-in. coke was particularly noticeable; in the first series (20 per cent. volatile additive) the extra+4-in. material varied from about 30 per cent. with a 301 coal to 100 per cent. with a 501/2 class coal, while in the second series (14 per cent. volatile additive) this increase varied from about 50 per cent. with a 301 class coal to 20 per cent. with a 502 class coal for the addition of 20 per cent. of the low-volatile constituent. There is also a substantial increase in +3-in. coke and a slight increase in the material greater than 2-in.

The variation for 2-in. and 1½-in shatter indices caused by the addition of low-volatile coal with 20 per cent. of volatile matter showed that in general the changes using the 12 per cent. volatile

TABLE 1.—*Analysis of Coals Used in Tests.*

—	Craghead.	Lambton.	Fishburn.	Shotton.	Low-volatile coals.	
					1st series.	2nd series.
Rank	301	401	502	501		
Proximate analysis: per cent:						
Moisture	0.9	1.6	1.7	1.5	1.3	1.5
Volatile matter	26.5	32.1	34.2	32.1	17.8	12.4
Fixed carbon	64.6	58.9	58.0	61.0	72.8	76.5
Ash	8.0	7.4	6.1	5.4	8.1	9.6
Volatile matter (d.a.f.)	29.2	35.3	37.1	34.5	19.6	13.9
Total sulphur	0.96	1.63	1.07	1.41	1.46	1.86
BS Swelling No.	8½	8½	7½	8½	1	1

matter additive are similar, but slightly greater. In all cases, except for a 301 class coal, the shatter strength improves on the addition of low-volatile coal. The increase in the 2-in. shatter is greater than for the 1½-in. shatter and varies from about one point for 301 class coal to as much as 18 points for a 502 class coal, when using 14 per cent. volatile additive.

Additions of up to 40 per cent. of the 20 per cent. low-volatile coal causes continuous increases in the 2-in. shatter index, although these become fairly small when more than 20 per cent. is added; but with the 14 per cent. low-volatile coal a maximum is reached between 20 and 25 per cent. of added coal after which there is a slight reduction. On the other hand, the changes in the 1½-in. shatter index are smaller, showing a slight fall for the 301 type coal and an increase of about 4 points for the lower rank coals.

It should be noted that although agreement concerning most physical characteristics is obtained between test oven and large scale, the abradability characteristics as measured in the test oven appears to be about 7 points lower than would be obtained in normal practice. There is, of course, an increase in the coke yield on the addition of low-volatile coal which will be accompanied by a corresponding decrease of by-products, but for the small additions this is not likely to be very significant in commercial practice.

Addition of Breeze

Varying amounts of low-volatile (1.5 per cent.) coke breeze have been added to respective 301, 401 and 501 rank Durham coals, the breeze being ground to a varying degree of fineness and three sizes used in the test, designated "coarse," "normal" and "ultra-fine." Tests with high-volatile breeze showed that the changes in physical properties of the cokes follow at the same general pattern as with the low-volatile normal size breeze.

The results showed that the addition of coke breeze to Durham coking coals, provided that the breeze is ground at least fine enough to pass a 10BS sieve, can cause an improvement in the yield of large coke, a substantial increase in the 2-in. and 1½-in. shatter indices, without impairing the abrasion properties to a great extent. The optimum quantity to add appears to be 3½ per cent. for 301 and 401 rank coals and 4½ to 5 per cent. for 501 rank coals.

The addition of breeze is beneficial in improving the shape of the coke. This is particularly applicable to some 501 rank coals, which when carbonized alone produce coke of irregular, fingery shape. With such coals a 4 per cent. addition of breeze makes the coke much more blocky and cubical in shape. It has also been noted during the experiments that addition of breeze reduces the tendency to form free and attached sponge during carbonization. The tests have also shown that all cokes made from blends containing 10 per cent. or more breeze have a much coarser and granular structure than cokes made from the neat coals or with smaller breeze additions. This structure is reflected in the figures obtained for abrasion measurements.

The moisture of coal as charged affects the bulk density of the coal in the ovens and the rate of throughput; thus it is of economic importance. The increase in the moisture content of carbonization coals is causing concern in Europe, America, and Great Britain. Moisture affects transport cost, handleability, blending, amount of effluent and damage to ovens, in addition to bulk density and throughput.

The bulk density of any particular moist coal charged to coke ovens can be increased by the addition of small quantities of oil. In the oiling tests the experimental oven itself was used for the measurement of bulk density. This requirement necessitated charging the coal to a constant level up to the bottom of the levelling door. The dimensions of the oven are such that at this level the volume occupied by the coal is 12 cub. ft. Knowing the weight of charge, the bulk density in lb. per cubic foot was readily calculated.

Carbonization was carried out at a flue temperature of 1,180 deg. C. and under these conditions the charges were fully carbonized in 17½ hours. A household spray was used for the addition of the oil to the coal.

Results show, in the case of the 301 coal, a progressive increase in bulk density of the coal by the controlled addition of oil up to ½ per cent. at which value the increase weight of coal per unit volume was 7.9 per cent. With further additions of oil up to 1 per cent., the bulk density decreased slightly. With the 501 coal the peak bulk density was reached with the addition of ¼ per cent., which value corresponds to an increase of coal per unit volume of 7.4 per cent. Further additions of oil up to ¾ per cent. decreased the bulk density. The addition of oil has little or no effect on the physical characteristics of the cokes.

With the 301 coal the addition of oil up to ½ per cent. slightly improves the abradibility of the coke. With the 501 coal there is no change in the abradibility of the coke by oiling.

Scrap Iron and Steel Exports from Australia

IN a recent statement, the Australian Deputy Prime Minister and Minister for Trade, Mr. J. McEwen, announced that no material changes would be made in the arrangements for the export of scrap iron and steel during 1960. In the first half of 1960, quota exports would be fixed at 30,000 tons, and would probably remain the same figure in the second half of the year.

The previous system of quotas based on exports during 1952-53 will now be abolished. Quotas for the first half of 1960 are to be based on dealers' deliveries to local users of scrap during the six months ended September 30, 1959, and for the second half of 1960 on deliveries to local users during the six months ended March 31, 1960. Conditions regarding exempt areas, exempt types of scrap, and scrap which cannot be economically recovered for use by local industry will, in general, remain the same as at present.

Monorail and Monorope Haulage

INSTALLATIONS IN A BELGIAN COLLIERY

THE Belgian colliery Werister has introduced monorail and monorope transport for a number of applications, described in the November, 1959, issue of "Bulletin Technique-Mines," published by the Institute National de l'Industrie Charbonnière. All headings and stone drifts, some roadways in seams dipping between 30 and 35 deg., and other places where supplies are handled, have been equipped with this flexible system of transport.

Several manufacturers offered suitable equipment, but the colliery decided to design and manufacture a simplified version in their own workshop, based on the second-hand rails, weighing 9 lb./ft., as carrier rails. Fig. 1 shows how the rails were connected by means of fish-plates. The L-shaped sides of the fish-plates were also made from old flat-bottomed rails by cutting off the head and one side of the bottom flange. The hoop, welded to the fish-plate, serves as a means of suspension from steel arches or other support elements.

The design of the load-carrying rollers is shown in Fig. 2. Axles for the rollers were formed from the end of pneumatic coal-pick steels. It was made possible to reach two working districts from one common supply line by the use of simple points and crossings.

For the transport of mine timber, two chains are slung around the props and each suspended from one roller. For the transport of arches, C-shaped cradles are available; wire mesh containers are used for other supplies. For transport along inclined roads, only a simple single-drum winch has been found necessary and for a load of ½ ton, a 5-h.p. winch with ⅜-in. dia. rope was found adequate.

On horizontal roadways, twin-drum winches are required, to form an endless-rope system. In this case, a 12½-h.p. motor was found to be adequate for handling a 1-ton load over a distance of 1,650 ft. at a speed of 10 ft./sec.

A simple safety catch, shown in Fig. 3, to prevent trolleys from running away downhill in case of rope fracture, was also designed by the colliery staff. The pull of the rope which is attached to the end of the stirrup "a" keeps the eccentric cam at the end of the lever "b" clear of the underside of the rail. When the rope breaks, the weight of "a" and "b" engages the eccentric cam against the rail and stops the trolley. The peg "e" is only inserted when the catch is not required.

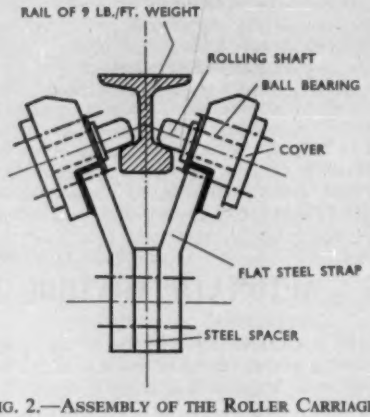
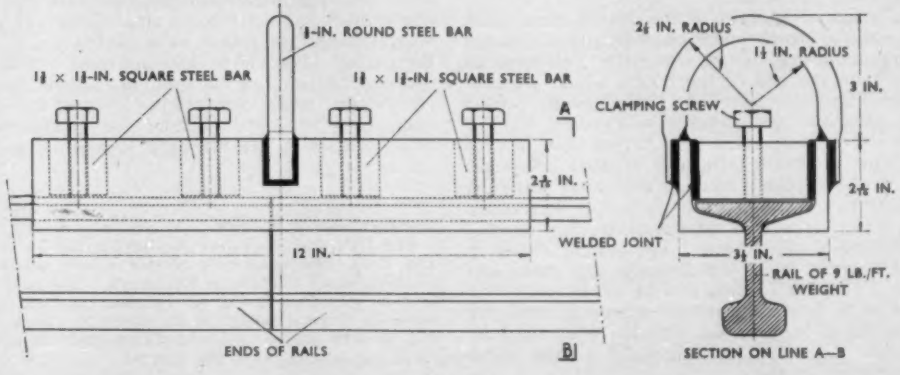


FIG. 2.—ASSEMBLY OF THE ROLLER CARRIAGES.

FIG. 1.—RAIL JOINTING BY FISHPLATES.



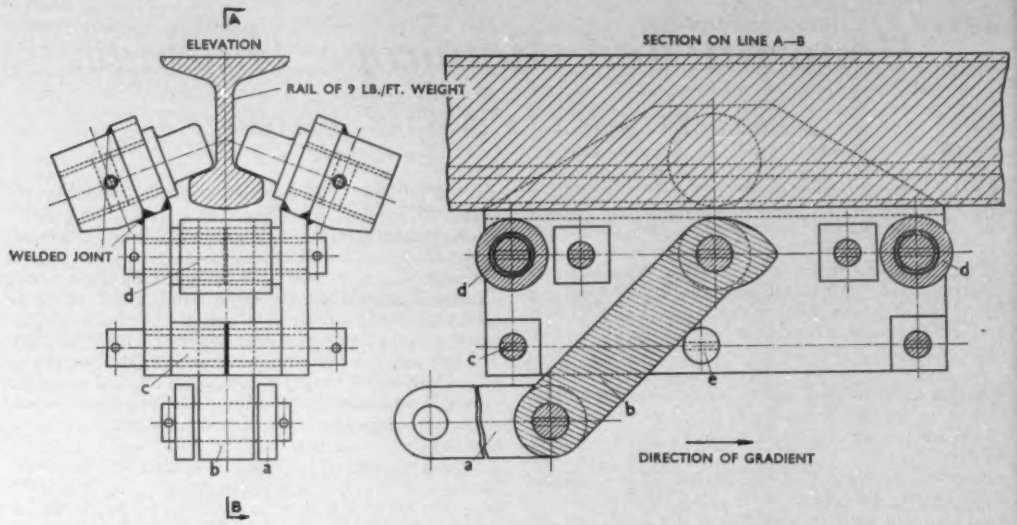


FIG. 3.—SAFETY DEVICE IN THE EVENT OF ROPE BREAKAGE.

In some cases, a monorail-system was also found useful to help the men travelling up steep inclines. A rope, with loops every 7 ft., was attached to a roller and pulled upwards by it. Experience at Werister Colliery has shown that the low cost of such a transport system is written off by the savings achieved in a very short time.

Advantages were also apparent in locations where ordinary mine cars could only be handled with difficulty.

AUTOMATIC CONTROL MECHANISM FOR BOOM LOADERS

A MECHANISM which effects the automatic raising and lowering of booms used for loading coal into wagons has been designed by Mr. C. K. Wallace, group electrical engineer in the Eastwood Area, East Midlands Divisional Coal Board. The purpose of the device is to prevent undue breakage of coal by ensuring that the coal does not fall an excessive distance into the wagon from the boom.

The essential features of the device are a small relay control panel which controls the starter for the boom lifting motor, and two cam-operated switches on the end of the boom, which are connected to the relay panel and automatically control the boom while the loading is proceeding.

One switch is operated by a hinged lever, curved to a scimitar profile, which is situated below the loading end of the boom so that after initiating the lowering of the boom into an empty wagon, the boom motor is switched off due to the lever striking the bottom of the wagon. The second switch is operated again by a cam from a flap plate suspended below the loading end of the boom.

As coal is delivered into the wagon it builds up until it comes into contact with the 6 in. by $\frac{1}{4}$ in. flap plate suspended the full width of the boom on a shaft on the underside of the boom; this plate operates a switch causing the boom to rise, the amount of travel being governed by the profiling of the cam actuated by the flap plate. This process continues until sufficient coal has been put into one end of the wagon, when it is lowered and the equipment reset by the wagon lowerer.

The equipment incorporates a safeguard in the form of a pull wire running underneath the boom loader to prevent the boom striking the end of the wagon should the wagon be in such a position that the curved hinged lever does not reach the bottom. The mechanism can be used on booms operated electrically, when the relays operate the motor contactors, or hydraulically or pneumatically, when the relays are arranged to operate solenoid valves.

ISI Card-index Service

The Iron and Steel Institute has started an abstract and book title index-card service which will consist of index cards containing the abstract and new book titles as published in the ISI Journal, classified by the universal decimal system of classification. These cards will be sent out to subscribers fortnightly in advance of their publication in the journal.

OXYGEN IN STEELMAKING

Evaluation of Converter Data for the Open Hearth

The use of oxygen in the Bessemer converter is surveyed for its possible interest to the open-hearth steelmaker considering the use of oxygen in the open hearth. The present article is the second part of a study by W. Schreiber, and first appeared in Radex Rundschau, 1959 (3).

WHEREAS some of the methods for supplying oxygen to open-hearth furnaces have been known for a number of years and are more or less widespread, the blowing of oxygen on the bath through lances inserted through the furnace crown, or in some other suitable way, is comparatively recent. Working an open-hearth furnace with an oxygen lance in the crown, will probably gain increasing importance in the future. To some extent it is comparable with those new steelmaking processes developed in recent years, which more or less operate by direct refining with technically pure oxygen introduced in the gas phase.

In this article the use of oxygen in open-hearth furnaces is considered on the basis of published information on the oxygen refining processes to see whether some data can be gleaned therefrom for the benefit of the first-named development, although it is not proposed to restrict the function of the open-hearth furnace to a purely oxygen-refining process.

For this purpose, information has been sought from published literature, more particularly in regard to: (1) The methods of steelmaking using oxygen without additional heat and their characteristics, starting from the assumption that a survey of this kind would be of interest to the steelmaker who is not yet using oxygen; (2) processes using an oxygen blast in the various types of converter, particularly in regard to possible parallels with blowing by lance in the furnace crown; and (3) the causes of the emission of brown oxide fume and the possibilities of its suppression.

Within this framework, the metallurgical processes in the metal bath and the slag will only be briefly considered.

SURVEY OF OXYGEN REFINING

The LD Process

The LD Process which today is already universally employed was first developed to the commercial stage in the Linz and Donawitz Steelworks, on the basis of certain preliminary experiments, for instance, by C. V. Schwarz[23], R. Durrer and H. Helbrügge[33]. The refining of the liquid pig-iron charge to which scrap for cooling as well as slag-formers are added, is conducted in a converter into which oxygen is blown on the bath through a nozzle or lance suspended perpendicularly above (Fig. 1).

The documentation available in regard to this process is in some cases several years old, but it is unlikely that further important changes have been made[1–8]. In recent years, several additional reports have appeared on new LD installations taken into service in various countries.

The following working data for a 30- or 50-ton converter, respectively, are given briefly:

Charge—Scrap: up to 25 per cent.[3], standard Linz[4] and Donawitz[8/3] 16-18 per cent., even higher values with a Si-rich pig-iron[18].

Lime: Linz 5-6 per cent., Donawitz 4.5 per cent.[4] (Si content of the pig-iron in Donawitz lower than in Linz). Dominion Foundries 7 per cent.[30].

O_2 plants: Linz[8/4] Linde-Frankl 2,100 cub. m./hr. 98 per cent.; 1,980 cub. m./hr. 99.5 per cent.;

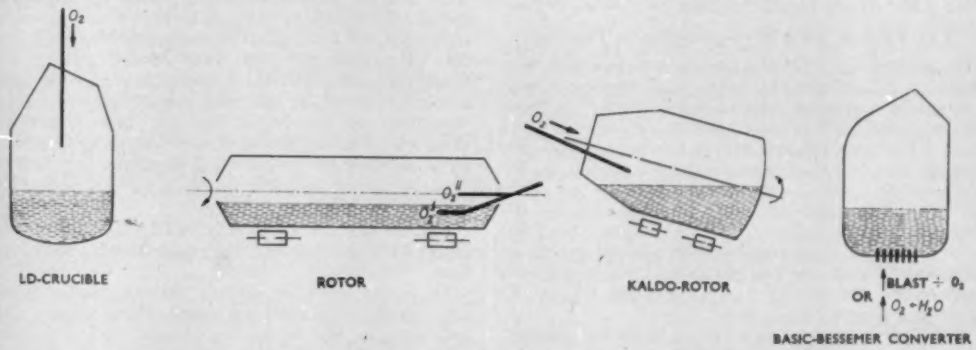


FIG. 1.—DIFFERENT METHODS FOR OXYGEN REFINING.

Donawitz[2] 99.5 per cent.; McLouth[30] 4,000 cub. m./hr. 99.5 per cent.; Dominion Foundries[34] 3,000 cub. m./hr. 99.5 per cent.

The high degree of purity is required in order to ensure the required low N_2 content in the steel. High pressure O_2 supply: 25 kg/sq. cm. (356 lb./sq. in.[2] Power consumption: 0.8 to 0.9 kWh./cub. m. O_2[2] and 0.6 kWh/cub. m.[34].

Amount fed to 30-ton converter: 6,000 to 7,000/cub. m./hr.; pressures, below 4-12 kg./sq. cm. (57 to 171 lb./sq. in.) and standard 8-10 kg./sq. cm. (114-142 lb./sq. in[8/3].).

O_2-consumption: Per ton of raw steel 55 to 57 cub. m.[1], in addition 2 to 3 cub. m./ton for hot blowing, cleaning, etc., altogether about 60 cub. m./ton[8/1], and 52 cub. m./ton[34].

Duration of heat: Duration of blow, 18 min[8/3].; 22 to 25 min[5].; total heat period, 40 min.; duration of blow, 22 min.; total heat period, 34 to 45 min[30].

Iron yield: Donawitz[4], charge, 855 kg. pig-iron; 162 kg. scrap; 1 kg. slag promoters; 1,018 kg., liquid yield 927 kg. =about 91 per cent. Linz[8/1] about 90 per cent.

Output: 30-ton converter, Linz 27 to 30 charges/24 hr. =1.25 charges/hr. or about 37.5 ton/hr[5].; up to 34 charges/24 hr. or 44 ton/hr.[8/3]; up to 43 charges/24 hr. or 55 ton/hr.[11]; McLouth 40 to 60 ton converter; up to 32 charges/24 hr. or 60 ton/hr.[30]; waste-heat boiler: 1 ton steam/ton steel; steam temperature 450 deg. C.

Lining life: As stated for Linz, in 1954, converter linings gave 190 to 240 blows, or an average of 215. Magnesite-dolomite consumption 5 kg./ton.[8/1 3] According to H. Trenkler, 1958[11], lining life was 250 blows with a total consumption of 5.5 kg./ton. F. McMulkin gives 250 blows and a dolomite consumption of 10 kg./ton.[30]. A. Wegscheider, 1956[6], reports on lining life with magnetite brick, on the basis of tests with other types of feed, in which life of 400 blows was attained, which agrees with R. C. Austin's data in the case of McLouth[13]. More recently at Donawitz a life of 600 blows was attained with special magnesite bricks.

Dust produced: 8 to 10 kg./ton[3]: Linz: [8/1] 5 per cent. $> 1\mu$; 45 per cent. 1 to 0.5μ; 50 per cent. $< 0.5\mu$. Donawitz: [4] 15 per cent. $> 1\mu$; 65 per cent. 1 to 0.5μ; 20 per cent. $< 0.5\mu$.

LD Process with High-phosphorus Pig-iron

Operating the LD process, an attempt has been made in Huckingen to refine basic-Bessemer pig-iron using a similar type of equipment[9, 10] and for this purpose a 25-ton basic-Bessemer converter was used. The process appears to be feasible for producing steel equal to open-hearth.

Working Data—Scrap charge up to 40 per cent.; O_2 addition, 4,200 cub. m./hr. reduced by the metallurgical reactions (dephosphorizing) to 2,400 cub. m./hr.; O_2 consumption with a blowing time of 45 min., 85 cub. m./ton pig-iron; O_2 consumption with 60-min. blow, 115 cub. m./ton pig. Yield, 82 to 86 per cent.

Lining life assumed to be from 80 to 100 charges, compared with about 300 charges in the basic-Bessemer process. Dolomite consumption: O_2-process, 30 to 40 kg./ton; basic-Bessemer process 12 to 14 kg./ton. The results at Pompey[30] where various improvements have been made in the method of working are still not considered satisfactory.

OCP Process

In Luxemburg, a process (OCP) has been developed on which E.Metz[38] has reported. According to this, together with the oxygen, powdered lime is blown through the lance, to the amount of about two-thirds of the total quantity of lime used. The tests were made in a 26-ton converter and it appears that with this process a substantial advance has been achieved in the processing of basic-Bessemer pig-iron by the LD method.

Working Data—Scrap charge, 21 per cent. (during tests).

Lime, 8 to 12 per cent. about two-thirds of which, 65 to 80 kg./ton is blown in powdered form. O_2-feed, Maximum 9,000 cub. m./hr.; below 17 kg./sq. cm. (242 psi) O_2 consumption 55 cub. m./ton. Duration of blow 16 to 20 min.; Duration of heat 40 to 45 min., yield, about 90 per cent. Dolomite consumption assumed to be 7 to 10 kg./ton.

The IRSID-OLP process according to B. Trentini and M. Allard[40, 41] is worked in practically the same way.

H. Trenkler reports[11] on attempts to refine by the LD process pig-iron containing 0.5 to 1.5 per cent. P content which is between open-hearth pig-iron and basic-Bessemer pig. From the metallurgical aspect, the problem is solved by dephosphorizing before decarburization and slag changing. Lime consumption is 11 per cent.; duration of melt, longer than the normal LD charge; lining life 160 heats; consumption of refractories 7.5 kg./ton.

The processing costs with this method are higher compared with the LD process using open-hearth pig, but it is considered in the comparison that a similar increase in the costs occurs during the processing of a pig-iron of this grade in the open-hearth furnace.

Rotor Process

The Rotor process, developed in Oberhausen[12] uses a drum-shaped converter, with an adjustable speed, a permanent magnesite lining and tar-dolomite rammed fettling. The oxygen is blown in from the sides through two water-cooled lances, one being directed under the bath surface and the other above. The rotor process cannot be considered therefore as purely an oxygen blast treatment (Fig. 1). The appended figures relate to operation by a two-slag technique using Bessemer pig-iron.

Working Data—Rotor-converter; capacity 60 tons; speed, 0.1 to 0.5 r.p.m.

Charge per ton of steel is 997 kg. (2,198 lb.) pig-iron; 155 kg. (342 lb.) ore; and 125 kg. (276 lb.) lime.

O_2 feed: amount blown, primary feed: 1,000 cub. m./hr., O_2, 100 per cent. then about 5,500 cub. m./hr., O_2, 70 to 90 per cent., being a mean ratio of 1:4 calculated on 100 per cent. O_2. Pressure 4 kg./sq. cm. (57 lb./sq. in.); O_2 consumption 70

cub. m./ton, for hot blowing, 5 to 10 cub. m./ton; O_2 yield from ore: 27 cub. m./hr.

Duration of heat: Charging ore and lime 15 min.; pig-iron, 15 min.; blow, 60 min., deslagging, 10 min.; tapping, 10 min.; total 1 hr. 50 min. Iron yield, 98 per cent. of iron charge from all Fe-carriers; output with the foregoing ratios, about 30 ton/hr.; 1,000 to 1,200 ton/24 hr., or about 50 ton/hr. can be expected from a 100-ton rotor. Refractories consumption of dolomite, 50 kg./ton, probably reducible to 35 kg./ton. Working life of lances, 300 heats.

Kaldo Process

The Kaldo converter at Domnarvet, developed by B. Kalling[14, 15, 42], is a refining unit which can be considered as a halfway-house between the Oberhausen Rotor and the L-D converter. In a rotating, obliquely tilted, pear-shaped container, lined with a magnesite permanent lining and a tar-dolomite rammed fettling, a water-cooled lance blows oxygen on the bath surface through an opening in the throat at an oblique angle (Fig. 1). The Kaldo method, as in the case of the rotor process, has been developed for the refining of basic-Bessemer pig-iron. Here, dephosphorizing is substantially achieved before decarburizing, *i.e.*, with 1.5 per cent. C. the main P content has been removed. The process is operated with two slags, which are suitable for fertilizers. It can also be used with open-hearth pig.

Working Data: Kaldo-Rotor converter working basic-Bessemer charges. Capacity about 28 ton; tapping weight (1 rotor), speed, 0 to 30 r.p.m., a high speed resulting in a smaller FeO-content in the slag with a greater viscosity and *vice versa.*

Charge: Ore 55 per cent. for cooling instead of scrap 100 to 150 kg./ton; lime, 12 to 16 per cent.

O_2-addition: 58 to 70 cub. m./ton; average 65 cub. m./ton; lower under certain conditions[42]; O_2 pressure, 3 kg./ sq. cm. (43 psi).

Duration of heat: blowing time 40 to 50 min.; total time 75 to 100 min.; yield, about 90 per cent. of the Fe-charge.

With the above ratios, the maximum output is 22 ton/hr. (in practice 17 ton/hr.). About 50 ton/hr. can be expected from a 100-ton Kaldo converter. As a result of the shorter blowing time, when using open-hearth pig-iron, the output is increased by about one-third. Life lining, 50 heats. Dolomite consumption is 30 kg./ton, 10 kg. of which is recovered. Dust production, coarse, 1.5 kg./ton; fine, 10 kg./ton.

For a working installation, the continuity of output must be taken into consideration and, therefore, two converter vessels should be available. The changeover can be effected in 2 hr., or better still, there could be two complete Kaldo installations.

Bottom-blown Converter with Added Oxygen Blast

At this stage, methods should be mentioned which use the conventional basic-Bessemer converter, but work with an oxygen addition in order to improve the quality (Fig. 1). The oxygen is simply fed into the converter blast main, in front of the trunnions. The oxygen enrichment is restricted, however, to a maximum of about 35 per cent., since beyond this proportion, the stressing of the tuyere box becomes excessive.

If steam is fed into the tuyere, a volume ratio of 50:50 or up to 60:40 oxygen:steam can be attained in the absence of air[16–21]. The knowledge gained in this way is important in this connection on account of the smoke and dust problem with oxygen blast. It is of further interest that the scrap charge which otherwise, in each case depending on the pig-iron analysis, may at the most attain half the value possible with the LD process[21] can be raised to the same level if the CO_2 and H_2 waste gases generated are used for an after-burning over the bath[22]. In addition, the blowing of pig-iron with only 0.7 per cent. P and S is possible.

Otherwise these methods hardly appear to be competitive with the open-hearth process and are not therefore considered in this connection.

PROCESSES USING THE OXYGEN REFINING

Direct Refining

The opinions and experimental results of H. Kosmider and others[25], H. Rellermeyer and others[26] and, particularly, R. Hammer and others[27] are available in regard to the dynamic conditions of the oxygen jet and its impact on the bath. Their experience is of direct importance for the explanation of the refining process. Different trends and theories have appeared. The oxygen should penetrate as deeply as possible into the bath on the one hand to be fully utilized, and on the other hand to obtain, by high kinetic energy, a vigorous bath agitation and thus, with the combined effect, a powerful refining action. Reactions in the bath set up circulating flows and thus ensure the continuation of the process.

Both opinions are based on the assumption that the oxygen is taken up at the so-called combustion point known as the "hot-spot." H. Rellermeyer and R. Hammer have corrected this view, however. They find that a little of the oxygen is absorbed in the bath at the combustion point, but it is chiefly absorbed over the bath. Influencing factors are: the area of impact, the impact pressure or jet force, and the depth of penetration.

The area of impact is determined by the nozzle spacing and shape, but not by the pressure. The Laval atomizing nozzle is shown in Fig. 2. The optimum exit angle for a tube is, for instance, around 16 deg. according to some sources and 14 deg to others. The area of impact naturally increases with the nozzle set at a greater distance. If the initial pressure is constant, then the impact pressure is dependent on the nozzle distance and obviously decreases with increasing distance. It increases with the square of the velocity. The pressure determines the jet force.

The depth of penetration has been investigated in detail in model tests. In the case of a "free jet" such as that considered here, one must distinguish between: The laminar, narrow jet which produces a narrow, deep penetration, and the turbulent, expanding jet producing a broad, shallower

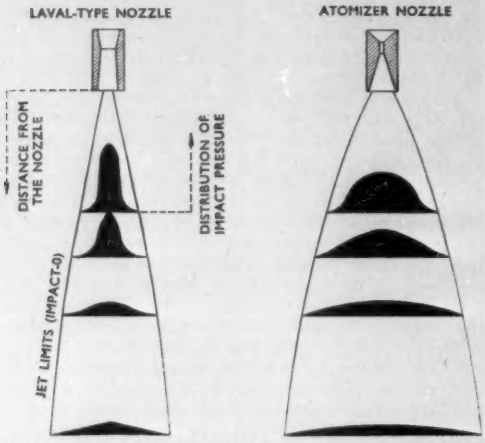


FIG. 2.—VARYING THE IMPACT PRESSURES WITH DIFFERENT LANCE DISTANCES (ACCORDING TO H. KOSMIDER AND OTHERS).

penetration. Under present conditions, particularly in regard to speed, only the turbulent jet is possible.

Considering the process according to R. Hammer, the jet impinges on the bath and penetrates more or less deeply, a part of the oxygen being absorbed by the bath surface, the rest, *i.e.*, the greater part, being deflected upwards. Between the entering jet coming from above and the annular jet escaping obliquely upwards, a nozzle effect is set up, the issuing jet being accelerated. This escaping secondary jet sets up friction and a suction effect at the oblique boundary of the penetration area. Thus, small droplets are detached and carried away. This produces atomization of the fluid. The reduced drops then fall back into the bath. At the same time, the above-mentioned friction sets up within the bath a circulation of liquid directed towards the centre (Fig. 3).

When the blow starts, this at first causes a shallower penetration. If the speed is increased, the carry-over of droplets from the bath, *i.e.*, the atomization process, begins. It is only at this stage that brown oxide fume is produced, a sign that the refining process has started. In order to obtain a deep penetration (for instance, depth=breadth), a greater volume of blast is necessary than for atomization; for instance, with a 16 mm. (0.63 in.) nozzle up to a distance from the bath of 750 mm. (29.50 in.), the beginning of atomization is still below the speed of sound. The reaction is already in progress before the jet can penetrate really deeply. This proves that direct refining occurs not in, but over, the bath.

Indirect Refining

In addition to the direct refining described above, *i.e.*, oxidation of the substances accompanying the iron and also, unfortunately, a small amount of the iron itself, indirect refining processes in the bath itself also play a part, *i.e.*, the tendency towards metallurgical equilibrium, as obtains, for instance, in the open-hearth furnace. The already mentioned bath circulation around the blowing point has a favourable action on this, comparable with the circulation in an induction furnace.

H. Hauttmann[8/2] explains bath turbulence and indirect refining by a precipitation of the already refined portions of the bath which have a higher specific gravity, 7.1 g. cub. cm. than the surrounding pig-iron with 6.5 g. cub. cm. The excess oxygen in the refined melt is released to the surroundings, according to the reaction $FeO+C=Fe+CO$. The precipitation in the middle of the bath is promoted by the pressure of the CO forming under the O_2 jet. H. Trenkler[1, 8/1] also speaks of a concentration gradient which develops from the "hot spot" spreading to the other parts of the bath and results in a turbulent bath circulation, accompanied by an abundant evolution of CO, with simultaneous "self-reduction."

The buffer-slag oxidation process described by H. Kosmider[25] is also of interest. In this process, refining is also effected not directly by the processes already described, but essentially indirectly through the medium of the slag or the oxygen contained therein, *i.e.* similar to the open-hearth refining process. With correspondingly low lance pressures, 3 to 5 kg./cub. cm. (42.6 to 71.1 lb./sq. in.) or even less, and long distances from the bath, 800 to 1,000 mm., the formation of a slag blanket is possible and this is not penetrated by the jet which is intentional in this process, for particular metallurgical reasons. The favourable accompanying phenomenon in this process is that with a slag blanket of 120 mm. with the given ratios, by avoiding direct contact between the O_2 and the bath, no brown oxide fume is produced.

In the opinion of the author cited, the buffer-slag process is not associated with any particular refining vessel but could also be adopted in other installations, for instance, in an open-hearth furnace. Also, a combination of both principles, *i.e.*

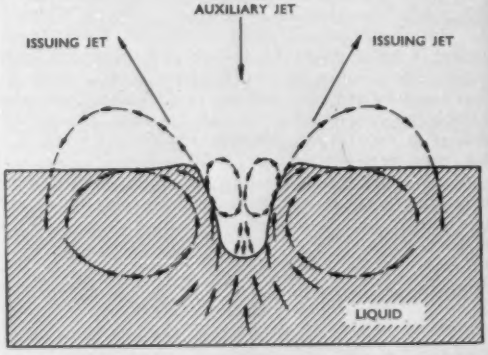


FIG. 3.—DIAGRAM OF THE LIQUID CIRCULATION DURING BLOWING WITH EXCESSIVE SPUTTERING (ACCORDING TO R. HAMMER AND OTHERS).

a preliminary period with direct refining by direct blowing on the bath and a subsequent period of indirect refining or finishing over the buffer slag, is conceivable.

In this group also should be included the Phoenix lance process described by H. T. Brandi[37]. In this, in the intermediate phase of an improved basic-Bessemer process, oxygen is blown into the tilted converter and a slag reaction process of this type is used.

In contrast to the buffer slag principle, a Voest patent[38] which should be mentioned at this stage concerns a nozzle design which produces a rotating jet with a similarly rotating action on the slag, working very satisfactorily to keep the bath free from slag.

To conclude, from the rather different views of various authors, one obtains the impression that refining by a combination of several processes, on, over and in the bath, and also to some extent in the slag, is successful and the question is which of these processes is or are superior to the others.

Bath Agitation by Blowing

In regard to the blowing lance (port lance) of the open-hearth furnace, the theoretical principles of the reactions in the Rotor process[12] as explained by L. V. Bogdandy and others[36] are of interest. The object is to bring the metal bath, covered by a slag blanket, into direct contact with the oxygen enriched atmosphere. For this purpose, the principle of the "Mammut" pump is used. Primary oxygen is blown under the bath surface by the rising lance, the expanding CO gases causing an upward motion of the surrounding metal which penetrates the slag blanket and is thus exposed to the action of the secondary oxygen.

There is a relationship between the amount of liquid conveyed upwards and the gas introduced, given by the equation:

$$\frac{dV_{f_t}}{dt} = \frac{I_t}{I_f}\frac{dV_{gas}}{dt}$$

in which V_{f_t} = amount of liquid, V_{gas} = volume of gas, I_t = depth of penetration, I_f = height of lift, t = time. The lifting or, in general terms, the bath-agitating action of the blast is thus greater with increasing depth of penetration.

Observations on the Incident Jet

Unlike, for instance, the LD-converter, when using the blower lance in the open-hearth furnace, good observation of the incident jet is possible, although there are certain differences in regard to lance distances and oxygen volume compared with the LD process. In a narrow circle of about ½ m. around the lance, smaller and larger drops are constantly spun upwards from the bath to a height of 20 cm. to ½ m. The action of the flame gases which generally by its force prevents a higher spraying of the drops is interesting. During the bath reversal, *i.e.*, with the fuel cut off, these smaller particles become visible and may reach close up to the arch. The combustion centre itself is hardly visible through this phenomenon but its reflection resembles an incident arc light.

Refining Vessel

A comparison must be drawn between an oxygen converter, for instance, an LD crucible, and the open-hearth furnace as a refining vessel as soon as the oxygen is introduced, not to increase the flame temperature but for the direct refining of the bath, *i.e.*, when the open-hearth furnace has fulfilled its purpose as a smelting appliance and the charge has been reduced almost completely to the liquid state. This is the instant at which, generally, the delivery of oxygen into or on to the bath is started (with high pig-iron charges, difficultly melting-down, C-values of from 0.5 to a maximum of 1.0 per cent. must be awaited).

The width of the bath in a large open-hearth furnace is greater than that of an LD crucible (internal diameter, in Linz, about 2,700 mm. (8 ft. 10 in.) and the depth of the bath somewhat less. The concentration of CO waste gases over the bath surface should be somewhat less. For their combustion, in addition to the volume of oxygen which leaves the bath again unused, the excess air of the combustion gases is also available.

H. Hauttmann[8/2] attributes considerable importance to the geometrical proportions and expresses the opinion that it is not possible to make LD steel in an open-hearth furnace. This comparison should, however, be restricted to the assumption that steel is to be produced exclusively by an oxygen blast, relinquishing the other possibilities of the open-hearth refining processes.

Whereas in the LD converter, for considerations of space and durability, the oxygen feed is restricted to a single lance, an ideal shape of the container being no longer insisted on, in the case of the open-hearth furnace, there are no considerations of space to restrict the number of lances. As a result of the greater bath surface and the smaller bath depth, distribution of the oxygen over the length is possible and even necessary, and two lances in the crown per furnace are already usual practice. Probably a further increase in the number of lances would prove advantageous.

Oxygen Feed

As already explained, lances with or without inserted nozzles are used for the oxygen feed. The essential calculations for nozzles are given in a paper by C. V. Schwartz[23], who has also given specific data on the refining rate in an open-hearth furnace, but without the use of oxygen. The top-blowing lance is water-cooled throughout, the nozzle being made of copper. The cooling water temperature should not exceed 40 deg. C.[3]. For cooling water consumption, a figure of 5,200 gall./hr. is given, depending on the distance from the nozzle to the bath[24]; another suggested figure is 66,000 gall./hr.[41].

Top Blowing Lance Refining

The following variables in actual working values are associated with lance refining: O_2—pressure in

front of nozzle; volume; velocity; distance of nozzle from bath; blowing time.

In top blowing, the pressure is from 8 to 10 kg./sq. cm.[8/3] to 10.5 kg./sq. cm.[29] In exceptional cases such as the buffer slag process the pressure[25] is 3-5 kg./sq. cm.; for the Rotor process, 4 kg./sq. cm. The pressure values for open-hearth furnace lances are of the same order of magnitude.

For the oxygen volumes, the available data indicate: 6,000 to 7,000 cub. m./hr.[8/3]; 2,400 cub. m./hr.[10]; 5,500 cub. m./hr.[12] The crown lances in open-hearth furnaces work with considerably lower volumes, *e.g.*, 1,000 cub. m./hr.[31]; 1,600 cub. m./hr.; 1,800 cub. m./hr.[35], these volumes in some cases being distributed between two lances.

Only scanty information is available in regard to the impact speed of nozzles and nozzle shapes. H. Rellermeyer and T. Kootz[24] mention tests in a converter-type container with a number of nozzles, having total cross-sectional areas of about 2.5 sq. in. for air and 1.8 to 2.0 sq. in. for oxygen. Velocities from about 660 to 3,600 ft./sec. are being used, subsequently reduced to from 1,800 to 2,400 ft./sec.

In the case of open-hearth furnace lances, velocities vary within fairly wide limits. In the case of a 1-in. nozzle (single lance) and a volume of 1,700 cub. m./hr.[31], velocity is 930 m./sec. Regarding the sub-division of nozzle discharges into several jets, in one such case, a feed was sub-divided into six single apertures, and in this case, with two lances, discharge velocities of only 180 to 280 m./sec.[20] were obtained.

For the LD-process, nozzle distances from the bath of 8 to 59 in. have been employed; in Linz, the distance is about 35 in.[8] In tests in Huckingen,[10] it was varied from 31.5 to 67 in. and by this means it was established that in addition to the effect on the bath, there is also an influence on the combustion of the CO-refining gases, *i.e.*, a greater distance gives improved after-burning. This should be ensured also in the open-hearth furnace, if sufficient air is available.

Blowing time and also O_2 volume per unit time are controlled in the case of the converter process, by the possible overall oxygen consumption and the time required for its absorption, with simultaneous development of the metallurgical processes, taking into account in each case the particular temperature ratios necessary. The latter also depend on the nature of the process, *i.e.*, on the pig-iron used.

Thus, for basic-Bessemer pig, a blowing time of 45 to 60 min. is reported[10, 12, 15], whereas with open-hearth pig-iron, blowing is accomplished in 18 to 20 min.[8/3 5, 20] In this connection, it must be borne in mind that the reference is to refining, starting from the original content of iron impurities in the pig-iron. The blowing times with the lance in the open-hearth furnace are in most cases longer.

Fume in Oxygen-refining

Reports vary in regard to the method of separating the oxide dust from the waste gases during oxygen-refining. Here, however, the possibilities of preventing the evolution of any oxide fume whatsoever require to be investigated, guided by the consideration that this is usually harmful to both roof and checkers of open-hearth furnaces; and should this not be the case, by the desire to reduce expenditure for dust-extracting plant if its use is compulsory.

It appears to be fairly certain that the evolution of brown oxide fume is a direct result of the very high temperature (3,000 to 3,300 deg. C.) generated at the combustion centre by the technically pure oxygen jet. This causes disturbance at the bath surface partly by evaporation and by rising droplets of iron[18, 29, 36]. The blower dust consists of up to 93 per cent. [8/1] or 80 to 90 per cent.[35] of Fe_2O_3.

In point of fact, the vapour pressure p of iron is very temperature-dependent. The data given in Table 1 have been given by H. Kosmider and others[18] with different temperature values at the combustion centre, *i.e.*, the temperature at the point of direct contact between the refining gas and the liquid iron, independent of the process:

TABLE 1.—*Combustion Centre Temperatures with Different Refining Gases.*

Refining gas.	Temperature, deg. C.	pFe.
Ordinary blast	2,300	45 mm. Hg.
Blast + 35 per cent. O_2 ..	2,650	460 mm. Hg.
O_2	3,050	M.P.* exceeded
$O_2 + H_2O$ (1 : 1)	1,950	Negligible

* Maximum p exceeded.

These computed temperatures should in practice be reduced by radiation. Thus, according to H. Hauttmann [8/2] the temperature in the vicinity of the combustion centre in the LD crucible is about 2,500 deg. C., according to G. S. Selkin;[35] in the open-hearth furnace, up to 2,400 deg. C., *i.e.*, still below the volatilization point. Since the volume of dust varies during the blow, it must also be concluded that there are time variations in the combustion-centre temperature.

As is clear from a number of sources,[15–21, 25] no brown fume is evolved if the process described above with the bottom-blown converter with oxygen and steam is adopted, the latter for the protection of the nozzle bottoms, or the steam added expressly for the prevention of fume. The desired action of the steam, or even of water, is to produce cooling at the combustion centre and by this means control the volatilization of the iron. It is thus to be considered, when working with the blower lance, whether the addition of steam or water is permissible, in what quantity, and under what conditions it should be adopted.

The cooling of the entire melt, which cannot be disregarded, is a function of the ratio of oxygen to the volume of steam. The steam is, however, not only a cooling agent by the heat of dissociation, but also an effective refining agent. 1 cub. m. of steam contains 0.7 kg. (1.54 lb.) O_2 compared with only 0.3 kg. (0.66 lb.) O_2 in 1 cub. m. of air. The refining action depends on the partial pressure of

the O_2 which already at between 1,400 and 1,600 deg. C is very high[16,17], while at 1,700 deg. C., dissociation is already 75 per cent. completed. The steam dissociates and oxidizes according to the formula $H_2O+Fe=FeO+H_2$. Thus hydrogen is released which should be consumed but which may also be absorbed by the melt.

In this regard, investigations made by J. Daubersy and A. Decker[20] in a bottom-blowing converter with O_2+H_2O (60:40) are available, also by H. Neuhaus[19]. The H_2-content of the steel is rather high initially but is normal at the end of the charge. Theorectical saturation is not attained. During tapping, there is a further reduction in the H_2 content and then again during rolling. Qualitative effects cannot be determined. It is not to be assumed that the danger of hydrogen absorption is greater with the oxygen-blast process. G. S. Selkin confirms[35] that no qualitative disadvantages are involved. In principle, therefore, no objections can be raised against a steam addition to the oxygen.

The volume of steam or, in general terms, the ratio of the addition to the oxygen, determines the degree of cooling of the combustion centre, for which Table 1 gives some indication. Data principally from the bottom-blowing basic-Bessemer converter are available which, however, are dictated primarily by the need to protect the nozzle bottoms from above. In Hagen-Haspe[18, 21], a volume ratio of 50:50 was adopted; the absolute values were 7,800 cub. m./hr. and 50 cub. m./hr., respectively. The resulting $O_2:H_2O$ weight ratio is 64:36 (specific volume of the steam=1.23 cub. m./hr. J. Dauberey[20] gives an $O_2:H_2O$ weight ratio of 60:40.

In the tests with the oxygen blast process in Hagen-Haspe[25], a steam addition was also tried, with $O_2:H_2O=75:25$, with a view to preventing fume before the formation of the buffer slag. In the Kaldo converter [95], water instead of steam was added, 7 litres (1.54 gal.)/ton steel, during the first minutes of the blow, *i.e.*, when dust formation is greatest. This had no effect on the heat balance of the process.

In the same way, water, but in doubled or trebled quantity per ton of steel, was used in the 180-ton open-hearth furnace in Zaporozhiye, as reported by G. S. Selkin and others[35]. There the two arch lances do not blow on to the bath but into it. The oxygen blast is prolonged from 30 to 90 min. after pig-iron charges with from 0.07 to 0.1 per cent. C. The $H_2O:O_2$ weight ratio is 0.93 during the melting period, which is about 1 hr., and 0.70 and later 0.47, in each case about 30 min., during processing. At 0.4 per cent. C., the water addition can be discontinued.

These large amounts of water, converted to steam, produce volume ratios corresponding to the oxygen-steam process in the basic-Bessemer converter, partially reducing the advantage obtained from the oxygen. Thus, with the water addition described, the charges melted with oxygen alone are prolonged from an average of 5 hr. 43 min. to 6 hr. 29 min. Nevertheless, increased output and a saving in heat of about 25 per cent. is still obtained compared with working without oxygen.

The result in regard to dust abatement is satisfactory. Working without oxygen, the amount of dust measured in the air shafts is about 2 g./cub. m. of fume (0.03 oz./cub. ft.). With a pure oxygen blast, the peak point of the oxide dust production is 32 g./cub. m. (0.49 oz./cub. ft.) and for most of the time it is above 15 g./cub. m. (0.21 oz./cub. ft.). With water added to the oxygen it is 4 to 6 g./cub. m. (0.06 to 0.09 oz./cub. ft.), with a maximum of 8 g./cub. m. (0.12 oz./cub. ft.). Thus the efficiency of dust abatement is about 75 per cent.

In the bottom-blown converter, the steam is simply added in the blast pipe. The steam pressure must be selected having due regard to the oxygen pressure used. In a bottom-blown converter in which an O_2 pressure of only 2.5 kg./sq. m. (35.6 lb./sq. in) is used, steam at 8 kg./cub. cm. (170.7 lb./sq. in.) is used[16]. In another case, 12 kg./cub. cm.[17] It is important, particularly with the basic-Bessemer converter, that the temperature of the O_2/H_2O mixture is above the saturation point of the steam under the pressure after mixing, *i.e.*, either superheated steam at 300 to 350 deg. C. is used or the oxygen is pre-heated, for instance, to 150 deg. C. This is to prevent water condensing in the nozzle bottoms. For the blower lance, these considerations naturally do not obtain.

The supply of water to the arch lances in the Russian furnace[35] is at 8 to 10 kg./sq. cm. (113.8 to 142.2 lb./ sq. in), a pressure exceeding that in the oxygen pipe. Water pipe and oxygen pipe are 2 in. thick. The water inlet is above the arch, immediately in front of the point of attachment of the lances, through a ¼-in. mouthpiece, set parallel to the oxygen pipe.

Up to the present the formation of oxide fume has been prevented by the addition of steam or water to the oxygen. A further possibility is the buffer slag oxidation process[25] already described.

It is assumed that the production of fume, *i.e.*, the vaporization of the iron, is prevented by the fact that with a suitably adjusted oxygen jet with regard to pressure, distance of lance and thickness of the slag blanket, the temperature of the underlying metal bath surface no longer reaches the critical point which, for instance, is not the case when the O_2 is fed from a greater distance, namely, from the head burners in the open-hearth furnace. The combustion centre is not any longer on the metal bath but on the slag and imparts to the latter that high activity ("oxygen potential") which is responsible for the process of indirect refining as a whole. If, however, in spite of the shielding action of the slag blanket, there is still some vaporizing of the iron and formation of oxide, then it is conceivable that the slag holds back the fume by a filtering action.

In considering the problem of fume, it should be borne in mind that its evolution is not uniform throughout the duration of the process. Smoke development is greatest at the beginning of refining, with a high C-content in the bath, and decreases

considerably during the finishing of the charge, both in the oxygen-converter and in the open-hearth furnace.

Summary

Technical parallels to be found between the use of oxygen in open-hearth furnaces and refining in the oxygen converter suggest an investigation with the help of the literature as to how far knowledge of the latter processes and comparison with them may be of interest for the open-hearth furnace. Points covered by this research are: the metallurgical equipment, and the technical means available for applying the processes; the reactions when the oxygen comes into contact with the bath; oxide-dust formation and the possibilities of preventing it.

To increase the output and thus the economy of the open-hearth furnace, great prospects are opened by the effective use of oxygen, in combination with the advantages inherently offered by the furnace. In this connection, knowledge of the pure oxygen refining process should not be neglected.

References

[1] Trenkler, H., "Arbeitsweise und Metallurgie des Stahlfrischens mit reinem Sauerstoff nach dem Aufblaseverfahren" (Method of working and metallurgy of steel refining with pure oxygen by the blast process). *Stahl und Eisen* (1952), p. 992.

[2] Rösner, K., "Anlage, Betrieb und Wirtschaftlichkeit von Sauerstoff-Stahlwerken" (Equipment, operation and economy of oxygen steelworks). *Stahl und Eisen* (1952), p. 997.

[3] Trenkler, H. (A. Ristow), "Vortrag bei der Internationalen Eisen- und Stahltagung" (Contribution to the International Iron and Steel Session), Lüttich, 1953. *Stahl und Eisen* (1953), p. 850.

[4] Cuscolca, O. (A. Ristow), "Entwicklung des Sauerstoff-Stahlverfahrens" (Development of the oxygen steel process). *Stahl und Eisen* (1954), p. 1536 (from *J. Metals*, 1954, 817).

[5] Kosmider, H., "Die Anwendung von Sauerstoff zur Erhöhung der Frischgeschwindigkeit bei Stahlschmelzöfen" (Use of oxygen to increase the refining speed in steel smelting furnaces). *Stahl und Eisen* (1955), p. 1433.

[6] Wegscheider, A., "Zustellung der Konverter im Blasstahlwerk Donawitz" (Fettling the converter in the Donawitz blast steelworks). *Stahl und Eisen* (1956), p. 595.

[7] Rosner, K., Wegscheider, A., "Erzeugung von Stählen höherer Festigkeit im Blasstahlkonverter" (Producing high-strength steels in the blast steel converter). *Stahl und Eisen* (1956), p. 1337.

[8] "Ein Jahr LD-Sauerstoff-Frischverfahren" (One year of the LD-oxygen-refining process). *Voest* (1954).

[8/1] Trenkler, H.

[8/2] Hauttmann, H.

[8/3] Klapp, F., and Rinesch, R. F.

[8/4] Schaden, H.

[9] Springorum, F. A., Speith, K. G., and Oelsen, W., "Ueber das Frischen von Thomasroheisen mit reinem Sauerstoff" (On the refining of basic-Bessemer pig-iron with pure oxygen). *Stahl und Eisen* (1953), p. 6.

[10] Springorum, F. A., Speith, K. G., Dürmann, O., and Ende H. v., "Betriebserfahrungen und Erkenntnisse beim Verblasen von Thomasroheisen mit reinem Sauerstoff" (Operating experiences and discoveries during the blowing of basic-Bessemer pig-iron with pure oxygen). *Stahl und Eisen* (1957), p. 1284.

[11] Trenkler, H., and Rinesch, R. F., "Anwendbarkeit des LD-Verfahrens auf Roheisensorten mit höheren Phosphorgehalten" (Applicability of the LD process to high-phosphorus pig-irons). *Stahl und Eisen* (1958), 883.

[12] Graef, R., "Grundlagen und Ergebnisse der Stahlerzeugung im Rotor" (Principles and results of steel production in the rotor). *Stahl und Eisen* (1957), p. 1.

[13] Austin, R. C. (A. Ristow), "Die Herstellung von Stahl nach dem Sauerstoff-Aufblaseverfahren in Nordamerika" (The production of steel by the oxygen blast process in North America). *Stahl und Eisen* (1957), p. 1090.

[14] Kalling, B., "Verbesserung des Thomasstahles bei den Eisen- und Stahlwerken Domnarvet" (Improving basic-Bessemer steel quality in the Domnarvet Iron and Steel Works). *Stahl und Eisen* (1953), p. 1446.

[15] Kalling, B., and Johansson, F., "Frischen mit Sauerstoff im Drehofen nach dem Kaldoverfahren" (Refining with oxygen in the rotary furnace by the Kaldo process). *Stahl und Eisen* (1957), p. 1308.

[16] Kosmider, H., and Hardt, P., "Blasen mit O_2 und H_2O-Dampf im Kleinkonverter" (Blowing with O_2 and H_2O-steam in the small converter). *Stahl und Eisen* (1950), p. 303.

[17] Esche, W. v. d., "Das Frischen von Thomasstahl mit überhitztem Wasserdampf oder O_2" (The refining of basic-Bessemer steel with superheated steam or O_2). *Stahl und Eisen* (1950), p. 322.

[18] Kosmider, H., Neuhaus, H., and Kratzenstein, H., "Die Abgasverhältnisse im Thomasstahlwerk bei Anwendung verschiedener Frischgase" (Waste gas conditions in basic-Bessemer steelworks using different refining gases). *Stahl und Eisen* (1954), p. 1045.

[19] Neuhaus, H., "Das Verhalten des Wasserstoffs beim Erblasen von Stahl im Sauerstoff-Wasserdampf-Konverterverfahren" (Behaviour of hydrogen during the blowing of steel in the oxygen-steam-converter process). *Stahl und Eisen* (1957), p. 1863.

[20] Dauberay, J., and Decker, A., "Frischen des Roheisens im bodenblasenden Konverter" (Refining pig-iron in the bottom-blowing converter. Contribution, International Session, Belgium, 1958). *Comptes Rendus*, p. 10.

[21] Kosmider, H., Weyel, A., and Neuhaus, H., "Ueber das Frischen von P-armen Roheisen im bodenblasenden Konverter" (On the refining of low-phosphorus pig-iron in the bottom-blowing furnace. Contribution, International Session, Belgium, 1958). *Comptes Rendus*, p. 19.

[22] Kosmider, H., and Weyel, A. (H. Neuhaus)., "Das Frischen von Stahleisen nach dem Sauerstoff-Wasserdampf-Verfahren" (The refining of open-hearth iron by the oxygen-steam process). *Stahl und Eisen* (1957), p. 816. (*Blast Furnace Steel Plant*, 1956, 483).

[23] Schwarz, C., "Zum heutigen Stand der Entwicklung des Frischens mit Sauerstoff im Siemens-Martin-Ofen und im Elektrostahlofen" (On the current state of development of refining with oxygen in the open-hearth furnace and in the electric steel furnace). *Radex-Rundschau* (1949), pp. 33, 73.

[24] Kellermeyer, H., and Kootz, T., "Beitrag zur Metallurgie des Oberwindfrischens" (Contribution to the metallurgy of blast refining). *Stahl und Eisen* (1954), p. 381.

[25] Kosmider, H., Neuhaus, H., and Schenk, H., "Vorverlegung der Entphosphorung vor die Entkohlung beim Frischen von Roheisen mit reinem Sauerstoff" (Transferring dephosphatizing to precede decarburizing in the refining of pig-iron with pure oxygen). *Stahl und Eisen* (1957), p. 1277.

[26] Kellermeyer, H., Knüppel, H., and Sittard, J., "Entwicklungswege beim Frischen phosphorreichen Roheisens mit Sauerstoff" (Development trends in the refining of high-phosphorus pig-iron with oxygen). *Stahl und Eisen* (1957), p. 1296.

[27] Hammer, R., Kootz, T., and Sittard, J., "Zur Mechanik des Oberwindfrischens" (On the mechanics of blast refining). *Stahl und Eisen* (1957), p. 1303.

[28] VOEST: Patent. *Stahl und Eisen* (1953), p. 243.

[29] "Was Geschieht beim Sauerstoff-Aufblaseverfahren?" (What happens during the oxygen blast process?). *Stahl und Eisen* (1955), p. 1345.

[30] McMulkin, F. J. (A. Ristow), "Die Herstellung von Blasstahl in Kanada und den Vereinigten Staaten von Amerika" (The making of blown steel in Canada and the United States of America). *Stahl und Eisen* (1955), p. 1399 (from *J. Metals*, 1955, 530, and *Iron Age*, 1955, 75).

[31] Ewans, R. W., "Die Betriebsweise von SM-Oefen" (Operating methods for the open-hearth furnace. Contribution, International Session, Belgium, 1958). *Comptes Rendus*, p. 130, Belgium; *Comptes Rendus*, p. 77.

[32] Bading, W., "Die Verwendung von Sauerstoff zum Frischen von Roheisen" (The use of oxygen for the refining of pig-iron). *Stahl und Eisen* (1957), p. 926.

[33] Heilbr gge, H., "Die Umwandlung von Roheisen in Stahl im Konverter bei Verwendung von reinem Sauerstoff" (The conversion of pig-iron into steel in the converter using pure oxygen). *Stahl und Eisen* (1950), p. 1208.

[34] Davies, D. O. (K. Guthmann), "Die Entstehung des braunen Konverterrauches" (The development of brown converter fumes). *Stahl und Eisen* (1957), p. 1623 (*Blast Furnace Steel Plant*, 1956, 44 and 108).

[35] Selkin, G. S., and Sadalja, N. J., "Die Bekämpfung der Staubentwicklung beim Sauerstoffblasen" (Overcoming dust development in oxygen-blast refining). *Stahl und Eisen* (1957), p. 884.

[36] Bogdandy, L. v., Dick, W., and Stranski, I. N., "Zur Kinetik der Stahlherstellung" (On the kinetics of steel production). *Arch. Eisenhüttenwes.* (1958), p. 329.

[37] Brandi, H. T., "Phoenix-Lanzenverfahren" (The Phoenix lance process). *Stahl und Eisen* (1958), p. 889.

[38] Metz, E., "Neue Untersuchungen des Frischens von Roheisen mit Reinsauerstoff" (New investigations on the refining of pig-iron with pure oxygen. Constribution, International Session, Belgium, 1958). *Comptes Rendus*, p. 77.

[39] Lambert, M., "Diskussionbeitrag Internat. Tagung. (Contribution to the discussion, International Session, Belgium, 1958). *Comptes Rendus*, p. 103.

[40] Trentini, B., and Allard, M., "Neues Verfahren zum Frischen von Roheisen mit reinem Sauerstoff und Kalkpulver" (A new method for refining pig-iron with pure oxygen and powdered lime. Contribution, International Session, Belgium, 1958). *Comptes Rendus*, p. 70.

[41] Trentini, B., and Allard, M., "Frischen von Roheisen mit reinem Sauerstoff und Kalkpulver. Verfahren IRSID-OLP" (Refining pig-iron with pure oxygen and powdered lime. IRSID-OLP process). *Rev. Metallurg.* (1958), p. 1095.

[42] Kalling, B., and Johansson, F., "Frischen von Roheisen mit Sauerstoff nach dem Kaldo-Verfahren" (Refining pig-iron with oxygen by the Kaldo process. Contribution, International Session, Belgium, 1958). *Comptes Rendus*, p. 31.

"A Survey of Mining Engineering"

SUCCESS of the Mining Machinery Exhibition, promoted by the Council of Underground Machinery Manufacturers and held at Olympia, London, last July, is reflected in the pages of "A Survey of Mining Engineering," edited by Sir Andrew Bryan and Mr. F. H. Harley and published by Industrial Newspapers, Limited, John Adam House, 17-19, John Adam Street, Adelphi, London, W.C.2 (price 15s., post free).

The survey contains 18 papers covering a wide range of mining topics. The authors have managed to be concise and yet comprehensive; in this day of the individual expert and a trend towards a narrowing of interests, it is decidedly useful to have a permanent and authoritative summary of developments in the various fields of mining. In addition to giving an outline of errors and achievements of the past, the authors were invited to be forward-looking in their views. In this respect they have been eminently successful.

Also included in the survey is a general review of the papers given at the symposium on Shaft Sinking and Tunnelling, held under the auspices of the Institution of Mining Engineers concurrently with the Mining Machinery Exhibition.

In the foreword to the publication, Sir Andrew Bryan expresses the hope that the survey will give mining engineers a picture of the shape of things to come in the industry and help them in the task of keeping the industry abreast of scientific and technological advances. "A Survey of Mining Engineering" should meet these aims. Its publication was conceived of a desire by the editorial staff of IRON AND COAL to provide a permanent and useful memento of last summer's exhibition. The prolonged dispute in the printing industry, however, delayed its appearance for some eight months. But the established tag "better late than never" is, we believe, fully deserved and this review of modern mining principles and practice will certainly be of considerable interest to all concerned with the coal-mining industry.

BCURA Bibliography, 1938-59

TO commemorate its 21st anniversary, the British Coal Utilization Research Association has recently published a bibliography of all its publications issued since 1938, copies of which are available from the association, at Randalls Road, Leatherhead (Surrey), price 5s., post free.

A classified subject index gives a ready guide to the wide variety of topics studied; in all there are some 1,200 entries. The author index lists the names of past and present members of staff and their collaborators in the universities and elsewhere, with references to their published work. Included in the bibliography are details of the patents taken out by the association, the books it has published and the translations that it has prepared.

New Depot Speeds Coal Handling

THE 65-year-old coal depot at Walworth Road, London, has recently been demolished and replaced by a redesigned system which will handle 70,000 tons of fuel a year. Whereas the Midland Railway Company, builders of the old structure, relied principally on a timber superstructure with iron and timber supports, British Railways has used steel for supports, superstructure, and chequer plate decking.

The total amount of steel used in the reconstruction, all of which was fabricated and erected by Redpath, Brown & Company, Limited, was 1,600 tons.

In addition to the supports and decking, it also accounted for such items as hoppers, chutes, turntables, stairs, handrails, and a column and beam support for the signal box.

Both depots—the old and the new—were based on the 20 ft. height difference between the railway and the road. At rail level the new depot comprises two sidings, each with a capacity of 20, 16-ton wagons; a cripple wagon siding, holding four wagons; three hand-operated steel turntables—two in the main sidings and one for the cripple sidings; 50 transverse unloading bays in one row of 30 and one of 20; two electric traversers, each equipped with a capstan capable of transporting a 36-ton (gross weight) wagon; and two capstans with fair leads adjacent to the reception and departure sidings for removing wagons. At ground level there are two series of loading docks served by the 50 hopper chutes and connected by circulating cartroads to the depot's Steedman Street entrance, and a weighbridge office with a 30-ton weighbridge.

The steel structure of the depot, covering an area of 63,000 sq. ft., cost £300,000. Consulting engineers were Sir William Halcrow & Partners, and the general contractors were C. J. Sims, Limited.

SKEFKO GOLDEN JUBILEE

GOLDEN jubilee of the Skefko Ball Bearing Company, Limited, Luton, is being celebrated this year. To mark the occasion the company has prepared a special issue of its house magazine, the Inner Ring, which contains a brief history of the undertaking from 1910 to the present day. In the early days preceding the first world war, it occupied a small and comparatively insignificant building set among fields on the outskirts of Luton. Today the factories and offices there, and at Sundon, cover an area of nearly 1,500,000 sq. ft., the capital exceeds £10,000,000, and the workpeople number over 5,000.

In a broadcast message accompanying the special issue of the magazine, the managing director, Mr. C. U. Magnusson announced that it had been proposed to set aside for the benefit of the employees, £100,000 to mark the jubilee. The special issue is an interesting and well-produced record of achievement.

ACCIDENTS AT MINES

Some Avoidable Instances

BRIEF accounts based on reports of HM Inspectors of Mines, draw attention to some of the fatal accidents which might have been avoided, during the third quarter of 1959.

The experienced operator of a cactus grab at a new inset in a shaft, received fatal injuries while releasing a 2-in. dia. air hose which had become trapped between the grab traversing carriage and the monorail. He had failed to turn off the air from the hose and the release of pressure moved the carriage on the monorail trapping him between the inner wheel of the carriage and the rail.

A driver servicing an underground diesel locomotive saw that a slide rod was not in the correct position for greasing, drove the locomotive forward without getting into the cab and was fatally crushed in the converging space between the locomotive and the side. Had he driven the locomotive from the correct position inside the cab as required by Transport Rules and common prudence, the accident could have been avoided.

Dangers in Waste Drawing

In a single-unit machine-cut conveyor face opposite a 7-yd. waste, two cuttermen, acting temporarily as packers, had advanced the chocks to the conveyor. They had withdrawn three settings of wood props and half-round wood bars and were attempting to pull out a wood stump in the unsupported waste when a fall of roof killed them. This accident might have been avoided if the sylvester provided had been used and the waste had been drawn off in the manner prescribed.

An experienced waste worker was killed on a machine-cut conveyor panel by a fall of waste when, after failing to withdraw the last remaining prop in a waste by means of a sylvester, he entered the waste and struck the prop with a hammer. The foolishness of such an action was obvious, and the failure of workmen present to restrain him is to be strongly deplored.

In a mechanized longwall face a packer, who had withdrawn three bar settings from a waste between strip packs, was preparing to withdraw the gob side prop of the fourth bar when he was killed by a fall of stone. The stone reeled out the bar above the packer's head and also the adjacent bar which was supported by only one prop. The weakness caused by the failure to support the bar properly doubtless contributed to the occurrence of the accident.

Haulage Accidents

A diesel locomotive hauling empty mine cars along an unlit roadway struck a stationary mine car behind which a byeworker was repairing the road. The byeworker was killed instantly. The locomotive had been used on an adjacent track earlier in the shift but it entered the track under repair on the assumption that the byeworkers had left. Such accidents can easily be avoided if there is efficient supervision where men are working close together.

While being raised to the surface up a slant on a manriding carriage at the end of his shift, a shotfirer was thrown off when his raincoat became entangled in the wheels of the carriage. He died from his injuries. Had he fastened up his coat properly this accident might not have occurred.

A collier walking outbye on the main haulage plane from his working place before the permitted walking period, died from injuries received after being struck by a moving train. He had not sheltered in the refuge hole provided and had he done so the accident would not have occurred. The dangers of travelling on haulage roads outside the permitted times cannot be too strongly emphasized.

Falls of Roof

A coal-cutter operator on a longwall conveyor face rising inbye at a gradient of 1 in 15 was killed by a fall in a working consisting of 19 in. of hard top coal and 18 in. of bottom friable coal separated by 18 in. of hard fireclay. The face had to be undercut and while the coal-cutter was being manoeuvred into a rib side cundie a length of overhanging top coal fell and crushed the operator. Had the top coal been dressed down or supported this accident would not have taken place.

On a single-unit longwall advancing face in a 4-ft. seam with a weak bind roof a 3-ft. 6-in. section was extracted by a trepanner machine. A collier who was preparing to advance a slide bar while the machine was stationary was killed by a large fall of roof. Had temporary supports been set between the last permanent support and the back of the machine the accident might have been avoided.

Radiation Effects on Bituminous Coal

EXPOSURE to atomic radiation alters the physical and chemical characteristics of certain coals, but leaves most varieties substantially unchanged, according to a statement from the US Bureau of Mines announcing preliminary results of its first efforts to determine the effects of irradiation on bituminous coal.

Studies by the bureau over the past two years have shown that coal is remarkably resistant to neutron and gamma-ray bombardment. It was noted, however, that irradiation does make coal harder and this effect might ultimately make possible manufacture of stronger coke.

In certain ranks of bituminous coal, irradiation also disturbs the delicate electrical balance within the coal molecule. This may make the coal react more readily with other materials and thereby permit improvements in processes for converting coal to liquid fuels and chemicals. The bureau emphasizes, however, that considerable research will be required to confirm this.

During the course of small-scale experiments, the bureau has analyzed irradiated samples representing all ranks of bituminous coal, including lignite. The samples, prepared in both powdered and lump form, were small, most of them weighing less than an ounce. They were subjected to high-level doses of neutron and gamma-ray bombardment in Government-owned atomic installations.

National Society for Clean Air

The winter issue of Smokeless Air, the journal of the National Society for Clean Air, contains reports and papers from the recent International Clean Air Conference in London, together with a complete set of abstracts of the 78 papers discussed. It announces that the 1960 conference of the society will be held at Harrogate from October 5 to 7 and that a Clean Air Exhibition will be held in conjunction with it. Sir Hugh Beaver has been re-elected president of the society, and Sir Graham Sutton, FRS, director-general of the Meteorological Office, continues as senior vice-president.

New Equipment and Products

Miniature Potentiometer

INTRODUCED by the Plessey Company, Limited, Ilford, is the type L potentiometer, smallest of the spindle-operated type in production.

The L series incorporates a brush assembly of unique design, and housed in an aluminium case, it is only 0.5 in. dia. Two tracks are included in the moulding; a carbon, resistive outer and a silver-loaded, conductive inner; these are bridged by a single, tension-located brush housed in an insulated carrier. By reducing the number of pressure contacts, greater reliability is achieved.

This new design of potentiometer operates within the temperature range of −55 deg. C. to 85 deg. C. and has a voltage limitation of 350 volts.

New Pump Range

MANY interesting features are incorporated in the Metricon type "W" pump, Fig. 1, manufactured by Metering Pumps, Limited, Ealing. The pumps, of which there are 12 standard models, are of the reciprocating type and are designed for adding solutions at a constant rate. All the pumps have a fixed stroke length of 2¾ in. Typical uses are for pumping clear corrosive liquid, alkaline suspensions, and boiler feed conditioning reagents.

Pump heads are of the ram type and rams are supplied in several diameters; either one (simplex) or two (duplex) heads may be fitted to the gear box. Suctions and deliveries of the heads can either be made together to give a greater capacity or operated separately for handling different solutions. Two solutions can thus be added in a fixed ratio by selecting pump heads with rams of different diameters. If a head which will give the exact ratio needed is not available, the strength of one of the solutions may often be varied.

Capacities of the type W pumps, at a nominal fixed output of 72 strokes/min., vary from 40 to 520 gal./hr. (simplex), and from 80 to 1,040 gal./hr. (duplex). Maximum working pressures vary from 250 to 3,000 lb./sq. in. Reduction gears can be incorporated to give a slower stroking speed than 72 strokes/min. if required. Pump stroking speed can be varied manually by a variable speed gear; automatic variation of speed can also be provided either by electronic or pneumatic means.

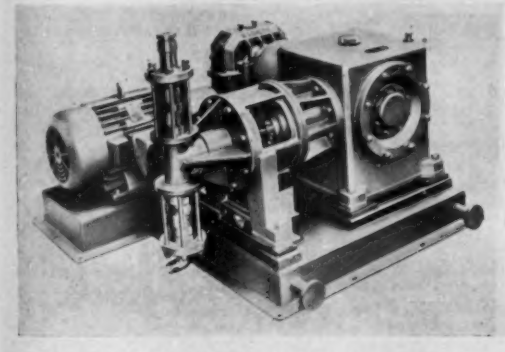


FIG. 1.—NEW METRICON TYPE "W" PUMP.

Various suction and delivery valves are available for use with the various pumping heads. For example, ebonite-lined heads have glass, ebonite or ceramic valves. Stainless steel pump heads incorporate a duplicate set of flat valves for high-pressure duties. For handling suspensions, a valve gear of special design is used.

Horse-power of the motor depends upon the particular duty and may vary from 2 h.p. to 10 h.p. Flame-proof, or weather-proof motors can be supplied as well as screen-protected machines.

Spur Cable Racking System

A FLEXIBLE cable-racking system, illustrated in Fig. 2, is claimed to cut installation costs considerably in comparison with other methods and has been introduced by Savage & Parsons, Limited, Watford (Herts).

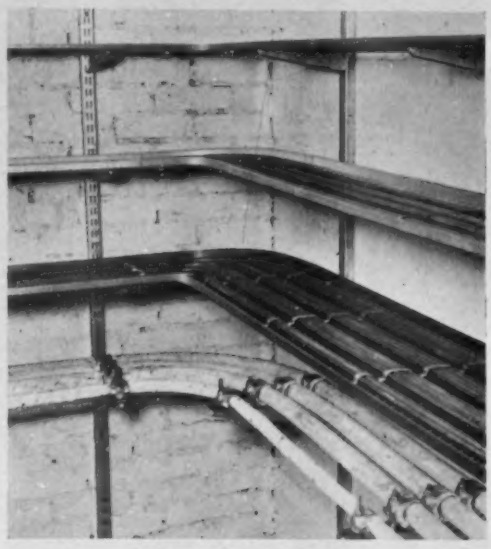


FIG. 2.—WALL-MOUNTED INSTALLATION USING SOME COMPONENTS IN THE NEW SPUR CABLE RACKING SYSTEM.

Based on the Spur adjustable shelving system, it uses modified Spur components and a number of special fitments specially designed for racking so that the heaviest types of industrial and power cabling can be carried with safety. The system consists, basically, of wall-mounted uprights of mild steel channel with slots at regular intervals in the face into which fit cantilever brackets ranging in size from 5 in. to 18¼ in. To make an "island" site, double-sided uprights can be formed by bolting two slotted channels together and fixing at floor and ceiling with heavy duty sockets.

A simple bolting system on the brackets fixes standard cable trays, or holds a Spur top plate to which standard cable clamps or cleats can be fitted. The height of the bracket can be adjusted easily by inserting the holding lugs into other slots in the face of the upright. The safe load for each bracket ranges

from 280 lb. for the 5-in. to 160 lb. for the 18½-in., but considerably greater loads can be carried by using a Spur supporting strut.

A leaflet describing the new system has just been published by Savage & Parsons, Limited.

Bench-mounted Grinder

NEWLY introduced by the Consolidated Pneumatic Tool Company, Limited, 232, Dawes Road, London, S.W.6, is an air-operated grinder for mounting on work benches. Known as the 319M (Fig. 3), the new

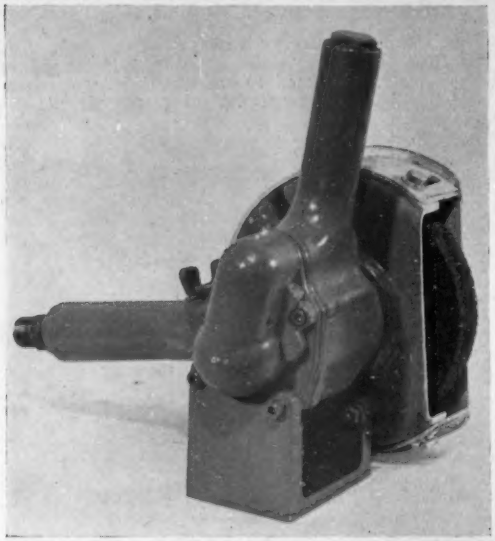


FIG. 3.—THE CONSOLIDATED PNEUMATIC 319M BENCH GRINDER.

grinder has a 6-in. dia. wheel 1 in. wide, the free operating speed being 4,500 r.p.m. The total height of the unit is 9 1/16 in. and the weight, including the guard, is 12 lb. The diameter of the air inlet connection is ¼ in. this being a male B.S.P. thread.

Power for the tool is developed by a vane-type motor, particular feature of which is the constant speed governor which maintains the wheel at the most efficient cutting speed from no load to full load and eliminates the possibility of overspeed when running free. A heavy valve spring and loose fitting valve prevent the valve from being jammed by foreign matter and a neoprene "O" ring give a leak-proof valve seal.

While the drilled baseplate on which the grinder is mounted makes it suitable for attaching to portable compressors for the maintenance of tools, it will also find a wide general application where occasional bench grinding tasks exist and where a supply of compressed air is to hand.

Belt-weighing Machine

DESIGNED to fit horizontal or inclined conveyors of any capacity and belt speed, having either flat or troughed idlers, the new SV Weightometer belt-weighing machine, Fig. 4, manufactured by the Merrick Scale Manufacturing Company, Limited, Bulwell, Nottingham, will totalize the weight of material passed over the conveyor.

The heart of the Weightometer is a mechanical integrator which continuously multiplies two varying quantities, the ever varying load on the conveyor, which often is subject to extreme and very rapid fluctuations and a slightly varying belt speed of the conveyor. The speed of any conveyor, while usually considered as constant, in reality varies slightly with the load, and in weighing, unless these conditions are taken into consideration, any final results will be erroneous.

All types of instrumentation can be supplied with the machine, both electronic and pneumatic. The weight recorder, which shows the weight of material passed over the conveyor, can be at a remote position if required. Advantages of the machine lie in the ability

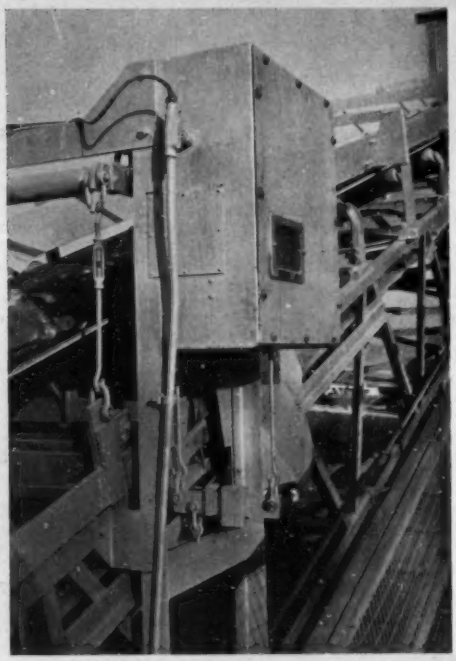


FIG. 4.—THE NEW SV WEIGHTOMETER BELT-WEIGHING MACHINE.

of the unit to be fitted to existing conveyors with a minimum of modification to the structure, together with simplicity of design and low headroom requirements.

The accuracy of the SV Weightometer is ± ½ per cent. of true weight passed when the conveyor is operating at full load conditions.

TAKING THE CHAIR at the third Oxford course of the Purchasing Officers' Association at Christ Church from March 21 to 25 will be Mr. S. W. Bennett, deputy director general, purchasing and stores, National Coal Board. A feature of the course is to be the general discussion on "The Effect on Buying Policy and Practice of Current Restrictive Practices Legislation."

British and Foreign Shipbuilding

LARGE SHIPS FOR OIL AND ORE TRANSPORT

ANNUAL summary of merchant ships launched in the world during 1959, including ships of 100 tons gross and upwards, issued by Lloyd's Register of Shipping, shows that during the past year there were launched in Great Britain and Northern Ireland 274 merchant ships of 1,372,595 tons (31 steamships of 465,650 tons and 243 motorships of 906,945 tons). This total is 29,385 tons less than in 1958, but, by maintaining a comparatively steady output, Great Britain and Northern Ireland has regained from West Germany the second place among the shipbuilding countries of the world.

There have been considerable variations in trend among other principal shipbuilding countries, and several have achieved individual records, but the sharp fall in output from Japan and West Germany was chiefly responsible for the first increase in percentage of world output recorded by Great Britain and Northern Ireland since 1955.

Compared with 1958 the tonnage fluctuations in the principal districts last year were as follow:—Clyde, 383,017 tons (−30,516); Tyne, 257,874 tons (+8,037); Wear, 247,527 tons (−20,816); Belfast, 120,421 tons (+20,168); Tees, 113,180 tons (−57,266); Mersey, 88,998 tons (+42,857); Barrow, 41,000 tons (+13,500).

Returns for 1959 show that the following 15 ships of 15,000 tons and upwards were launched, the first two and the last three being passenger ships and the remainder oil tankers:—s.s. Oriana, 41,000 tons (Barrow); Windsor Castle, 38,000 tons (Birkenhead); British Queen, 32,431 tons (Clydebank); British Power, 27,586 tons (Belfast); British Destiny, 27,585 tons (Wallsend-on-Tyne); Garonne, 24,513 tons (Walker-on-Tyne); Ellenga, 24,450 tons (Wallsend-on-Tyne); Esso Portsmouth, 24,125 tons (Walker-on-Tyne); Brandon Priory, 23,100 tons (Hebburn-on-Tyne); Shell Aramare, 22,000 tons (Govan); San Conrado, 21,179 tons (Haverton Hill-on-Tees); San Gaspar, 20,893 tons (Birkenhead); m.s. Amazon, 20,348 tons (Belfast); m.s. Aragon, 20,348 tons (Belfast); m.s. Eskfield, 18,851 tons (Govan).

Oil tankers totalled 49 of 528,928 tons (16 steamships of 324,242 tons and 33 motorships of 204,686 tons); a decrease of 48,457 tons as compared with 1958. This tonnage represents 38.5 per cent. of the total output for 1959.

Abroad

There were launched abroad during the year 1,534 ships of 7,373,109 tons (182 steamships of 3,212,582 tons and 1,352 motorships of 4,160,527 tons), a decrease of 494,894 tons as compared with 1958. As was then the case, no returns are available for China, East Germany, and Russia.

Attention has already been drawn to the sharp fall in output from Japan and West Germany. There has also been a considerable decrease in the tonnage launched in the United States of America, and smaller decreases are noted for Italy, France, Denmark, and Spain. On the other hand, the increased tonnage launched in Sweden, the Netherlands, Norway, Poland, Belgium, and Yugoslavia represents a record output for each of these countries.

The largest ships launched abroad during 1959 were as follow, all oil tankers and steamships except where otherwise stated:—Oriental Giant, 40,800 tons (Japan); Olympic Champion, 37,744 tons (W. Germany); Lake Palourde, 37,203 tons (USA); George L. Parkhurst, 37,190 tons (Sweden); W. Alton Jones, 37,190 tons (Sweden); National Defender, 36,904 tons (USA); Egeria, 35,800 tons (Italy); Fabiola, 32,125 tons (France); Esso Bremen, 31,690 tons (W. Germany); D'Artagnan, 31,263 tons (France); Altair, 31,174 tons (France); Polaire, 31,174 tons (France); *San Juan Carrier, 31,090 tons (Japan); *Oswego Freedom, 30,500 tons (Japan); Centaure, 30,330 tons (France); Caltex Plymouth, 30,000 tons (Japan), and Esso Aruba, 30,000 tons (W. Germany).

Next in size came 30 steamships and three motorships between 25,000 and 30,000 tons, all oil tankers. There were also launched 51 steamships and 15 motorships of between 20,000 and 25,000 tons each. All are oil tankers except that three carry ore and oil. The 21 steamships and 18 motorships between 15,000 and 20,000 tons comprised 20 oil tankers, four ore/oil carriers, six ore and eight bulk carriers, and a twin screw turbine dredger of 15,273 tons.

Ships intended solely for the carriage of oil in bulk totalled 316 of 3,846,325 tons (113 steamships of 2,690,124 tons and 203 motorships of 1,156,201 tons); a decrease of 351,569 tons as compared with 1958.

The output for 1959 included 911,851 tons launched in Japan, 567,978 tons in Sweden, 522,162 tons in the United States of America, 382,655 tons in the Netherlands, 349,722 tons in Italy, 344,467 tons in West Germany, 229,058 tons in France, 187,063 tons in Norway, and 119,543 tons in Denmark. Oil tankers represent 52.2 per cent. of all tonnage launched abroad, as compared with 53.4 in 1958 and 46.8 per cent. in 1957.

Of the steamships and motorships launched in the world during 1959, 619 of 4,214,933 tons (48.2 per cent.) are to be classed with Lloyd's Register.

* Ore and oil carrier.

CORRESPONDENCE

[We accept no responsibility for the statements made or the opinions expressed by our correspondents.]

SPECIAL TWO-FLUID BURNERS

To the Editor of THE IRON AND COAL TRADES REVIEW.

SIR,—During various preliminary experiments at the International Flame Research Foundation's research station at Ijmuiden, some qualitative trials have been made of special burners which may be applicable to certain specific problems.

The principle of the burners is based on the idea, developed within the Foundation several years ago, that a twin fluid injector burner for liquid fuel needs no special atomizing part providing that the atomizing fluid, which might be air or steam, is at a pressure greater than 1.5 kg.cm.$^{-2}$, gauge. Following this principle it is possible to fit nozzles of various forms to the burners without affecting the quality of the atomization produced in the "throat" of the exit. It is further accepted that a fluid under pressure leaving a vessel through an orifice does so in a jet whose axis is normal to the tangent plane of the vessel's surface at the orifice. Combining these two ideas it is evidently possible to vary the angle of the composite exit jet by changing the form of the exit section.

The accompanying figure shows two burners constructed after these ideas, both for oil firing, pierced, respectively, by a slot and by a ring of holes.

By increasing the angle of the jet, these burners yield very short flames, which might find application in cases where intermediate combustion products (hydrocarbons and other reducing gases) would be an embarrassment—for example, re-heating and blast furnaces.

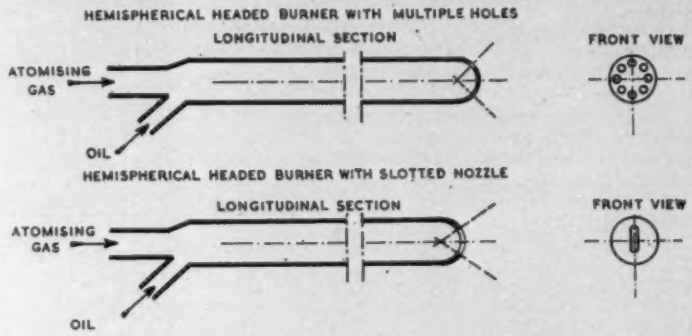
The ideas have been extended and a pulverized coal burner made with six 8 mm. holes distributed over the surface of a hollow sphere on the end of a cylindrical tube. By this means the coal is distributed in pure air immediately after its entry into the furnace and burns much more rapidly than with a normal burner because of the very high relative velocity between coal particles and combustion air—an effect more noticeable as combustion air velocity increases.

Hemispherical burners have been mentioned as examples of a type of nose which could evidently have other forms, such as conical, cylindrical, etc., with different nozzle forms (several holes, continuous annular orifices, flat or crossed holes, etc.). The exit nozzle could be a fixed or variable section and make any angle with the axis of the burner assembly.

The principle could equally be applied to gaseous fuels as to liquids and solids. In the case of oil burners, lack of a separate atomizer is a simplification. The presence of such an atomizer need not adversely affect the working of the burners.—

Yours, etc.,
R. R. KISSEL,
Principal Investigator.

International Flame Research Foundation, Research Station, Ijmuiden, Holland.
March 2, 1960.



TWO BURNERS FOR OIL FIRING, PIERCED, RESPECTIVELY, BY A RING OF HOLES AND A SLOT.

FORTHCOMING EVENTS

MARCH 16

Mining Institute of Scotland: Meeting at the Mining Laboratories, 79, Grassmarket, Edinburgh: "Human Relations in the Mining Industry," by L. R. Milligan.

Midland Counties Institution of Engineers: Meeting at the Mines Rescue Station, Ashby-de-la-Zouch: "Ventilation Phenomena Connected with the Stopping of Mine Fans," by J. D. Jones and F. B. Hinsley.

Institute of Welding (North London Branch): Meeting at 54, Princes Gate, London, S.W.7, at 7 p.m.: "Improved Steels and their Weldability," by J. F. Wilkinson.

MARCH 17

South Wales Institute of Engineers: Meeting at the Institute Buildings, Park Place, Cardiff, at 6 p.m.: "Large Diameter Boreholes for Ventilation and Stable-shaft Sinking," by J. H. Pedley.

MARCH 18

West of Scotland Iron and Steel Institute: Meeting at 39, Elmbank Crescent, Glasgow: "Technical Factors in the Production of Iron by Methods other than the Blast Furnace," by J. Taylor.

MARCH 22

Combustion Engineering Association (Scotland): Meeting in Glasgow: "Industrial Use of Gas," and "Problems of the Packaged Boiler."

MARCH 23

Institute of Fuel: Meeting at the Institution of Civil Engineers, Great George Street, London, S.W.1, at 5.30 p.m.: "New Process for Briquetting Coal without a Binder," by H. R. Gregory.

MARCH 24

Coke Oven Managers' Association (Northern Section): Meeting at the Three Tuns Hotel, Durham, at 7 p.m.: "Elimination of Dust and Drizzle from Quenching Towers," by E. R. Wapie, W. C. Ingleby, and R. Jackson.

National Association of Colliery Managers

MARCH 14

Midland Branch: Meeting at the Five Ways Hotel, Valley Road, Nottingham, at 6.30 p.m.: Paper by C. Round.

South Wales Branch: Meeting at the South Wales Institute of Engineers, Park Place, Cardiff, at 6 p.m. "The Further Application of Modern Management Techniques at Celynen South Colliery (Mon)," by F. C. Thompson.

MARCH 25

Kent Branch: Meeting at the Swan Hotel, Deal, at 7.15 p.m.: "Coal Preparation," by F. H. Price.

Development in Cooling-tower Design

A MAJOR advance in the design of cooling towers is marked by the announcement by Thermotank, Limited, Glasgow, of a new type of tower, weighing less than half as much as conventional towers of similar capacity. The saving in weight, and in size, is achieved by the use of a revolutionary fill material in which the water is cooled by a counter-current of air as it passes through very closely-spaced elements.

The structure is fabricated from rolled-steel sections, treated against corrosion, and the casing is of galvanized sheets, with side panels which can be removed for maintenance. The circular tower contains a top-mounted fan which draws the surrounding air up through it from the bottom. The fill, resembling a honeycombed structure, is arranged across the inside of the tower with the channels disposed vertically, and the cooling air passes up through these channels. Water enters the tower at the top, and is distributed across the surface of the fill by a centrally mounted rotating header pipe containing a number of perforations along its length through which the water streams on to the fill. The perforations vary in size along the length of the header to ensure an even distribution of water.

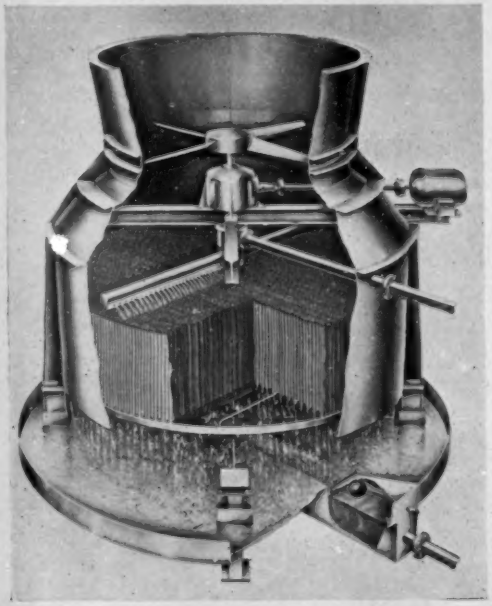


FIG. 1.—A CUT-AWAY DRAWING OF THE THERMOTANK COOLING TOWER SHOWING ITS MODE OF OPERATION.

The material of the fill has a high wettability, and the water passes down the walls of the channels in a thin, continuously-moving film. This ensures the maximum area of contact between the rising currents of air and the water, thus utilizing the volume of fill to its greatest capacity. A catchment tray at the base of the tower collects the cooled water for return to the appliance in which it is required.

The largest single-cell unit in the present range has a capacity of 90,000 gal./hr., with input and outlet water at 87 deg. F. and 75 deg. F., respectively, and wet bulb temperature of 68 deg. F. The diameter of the largest tower is only 20 ft., with a height of 12 ft. and a weight of 9½ tons.

The fill is made from alternate flat and corrugated sheets of a plastics-impregnated cellulose material. It is made up into rigid units which require only a very light supporting structure at the base. The entire internal area of the tower can, therefore, be occupied by the fill without need for bracings.

Two Grades of Fill

Two grades of fill are made, with two sizes of channel, the larger having a spacing of only a little more than one quarter of an inch. Since it contains a very large number of these channels in every square foot, the fill presents a very extensive cooling surface for the water to flow over, and due to the high wettability of the material the water adheres to the walls of the channels, allowing a free passage for the upward air currents. A film of water is continuously maintained, so that foreign matter remains in suspension in the water and is drained away, thus preventing choking of the narrow channels. It is estimated that for the same cooling effect, the fill occupies only about one-fifth of the space taken up by the conventional wooden slats.

So that the flow of air is not restricted by accumulation of water at the base of the fill, drainage is accomplished by a patented feature providing for serration of the lower face, which breaks the capillary bond and allows the water to run easily off the tips of the fill.

Normally a wettable material is mechanically weak, but the special plastic impregnation of the new fill imparts a high degree of wet strength without sacrificing its absorbent capacity. It also provides resistance to rotting and chemical degradation.

Work in the Neyveli Lignite Project

REMOVAL of overburden estimated at 27,000,000 cub. yds. over the lignite reserves at Neyveli, India, is expected to be completed by the end of March, 1961. The operation was inaugurated on May 20, 1957.

The integrated Neyveli lignite project envisages the mining of 3,500,000 tons of lignite per annum and its processing and utilization for the generation of electricity, the production of nitrogenous fertilizers, and for briquetting and carbonization to produce 350,000 tons of lignite briquettes per annum for domestic and other purposes.

Rot-proof Doors for Scottish Pits

AN effective answer to the danger of damage to buildings and fittings caused by humidity and steamy atmospheres has been found by the National Coal Board with the use of impregnated plywood for doors which are subjected to those conditions 24 hours a day. Known as Permaply, the material is produced by Venesta Plywood, Limited, and comprises a special type of plywood impregnated with phenolic resin which renders it rot-proof and resistant to delamination.

Permaply has been employed in the Scottish Division of the NCB to provide nearly 800 "skins" for doors in pithead baths, canteens, and kitchens at numerous collieries throughout Scotland. Supplied chiefly in sizes measuring 6 ft. 6 in. by 2 ft., and 6 ft. 6 in. by 2 ft. 8 in., the doors were made with a finished thickness of 1½ in., faced both sides with ¼-in. Permaply and lipped on all edges with mahogany or similar hardwood.

Construction features include 2½-in. softwood stiles, bottom and second bottom rails (for kicking plates), 4-in. softwood top rail, and 10-in. by 2½-in. side lock block. The cores are formed by ⅞-in. slats at about 10-in. centres.

New Catalogues, etc.

THE following new catalogues, booklets, etc., have been received and are acknowledged with thanks.

MORGAN COMPONENTS, LIMITED, Stanmore (Middx)—Illustrated leaflet covering brush holders.

HEAD WRIGHTSON STOCKTON FORGE, LIMITED, Stockton-on-Tees—Brochure reviewing rotary dryers.

FRY'S DIECASTINGS, LIMITED, London, S.W.19—Illustrated booklet referring to the basic principles and methods of improving diecasting design.

W. C. HOLMES & COMPANY, LIMITED, Turnbridge, Huddersfield—Leaflet No. 81 giving details of the Holmes-Rothemuhle multi-cell cyclone dust collectors.

MORGAN CRUCIBLE COMPANY, LIMITED, London, S.W.11—Leaflets No. GP. 53/59 and GP. 58/59, dealing with Foliac colloidal dispersions and Foliac colloidal graphite, respectively.

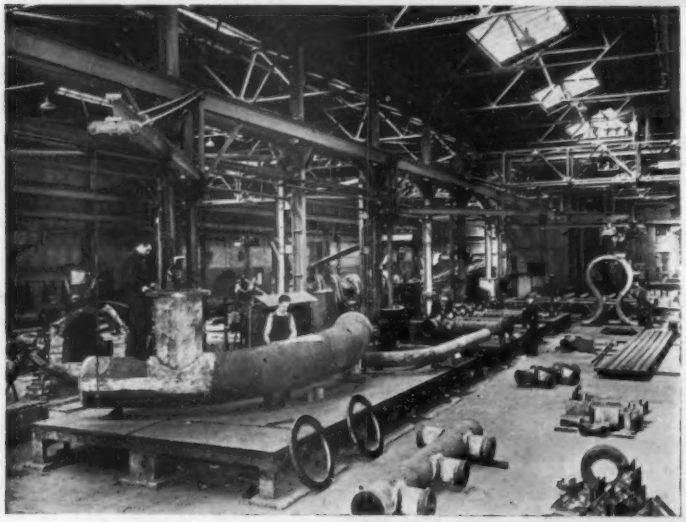
JOHN SHAW & SONS (SALFORD), LIMITED—Illustrated brochure covering many types of presses, including those for sheet-metal working, laminated plastic sheeting, rubber vulcanizing, scrap-metal baling, powder metallurgy, and miscellaneous use. Also mentioned are hydraulic pumps, accumulators, and control valves.

STEWARTS AND LLOYDS FORMS PIPEWORK DIVISION

AN important development, involving the creation of a new division, has taken place within Stewarts and Lloyds, Limited. It involves the setting up of a pipework engineering division which will be responsible for the making and marketing of all forms of manipulated pipework.

The new division is under separate management with its own sales, engineering, and manufacturing departments. Mr. James Carson, a director of Stewarts and Lloyds, has been appointed chairman of the division, with Sir Allan Elliott Lockhart, managing director.

In the past year during which the reorganization has been going on, the objective has been to create a division offering a complete service to customers. This will include the design, manufacture, erection, or site fabrication of entire pipework installations with ancillary equipment or the supply of pipework to customers' own drawings or from dimensions taken on site. A radiography service is also available to customers for the non-destructive testing of fabricated parts.



MANIPULATED HIGH-PRESSURE PIPEWORK BEING ASSEMBLED AT STEWARTS AND LLOYDS' TOLCROSS WORKS.

Company News

INDUSTRIAL COMPLACENCY

Foreign Export Threat Warning

CONCERN at the complacency of many British industrialists in the face of increasingly successful foreign competition, was expressed on Monday by Sir Patrick Hamilton, chairman of the Expanded Metal Company, Limited, London, S.W.1, when he announced the company's results. Sir Patrick, who recently returned from a world tour of industrial centres, said that if British industry did not immediately establish lifelines with the main world markets it would be drowned in rising world competition.

"The slogan 'export or die' is no idle catch-phrase," he declared, "but a stern recall to the economic realities of the twentieth century." He contrasted British technological pre-eminence in many sectors of industry with what he described as "lack of vision, imagination, and foresight on the sales promotion side, which is losing Britain markets she may never be able to regain."

He said that Expanded Metal was negotiating the establishment of a South African subsidiary, and that its Canadian company had broken even after only one full trading year.

The company is paying a final dividend of 14 per cent., making 20 per cent. for 1959 on capital increased by a one-for-five rights issue, against the 1958 equivalent of 16.8 per cent. (adjusting for the 25 per cent. scrip issue after the interim that year). Group profit, after depreciation, increased from £282,919 to a record of £342,087, and the net balance, after tax, rose to £191,296 (£122,713). Turnover was at a peak level.

A. V. ROE (CANADA), LIMITED—The board is omitting the quarterly dividend due on April 2.

CONSOLIDATED SIGNAL COMPANY, LIMITED—The net profit for the year to September 30, 1959, was £53,282 (£45,387) and the dividend is raised to 45 (40) per cent.

ARMSTRONG SHOCK ABSORBERS, LIMITED—Ordinary shareholders took up 95.2 per cent. of the recent rights issue. Excess shares are being sold for the benefit of entitled shareholders.

OLDINGS (HATFIELD), LIMITED—The company, a member of the Vickers, Limited, group, has acquired over 90 per cent. of the share capital of Modern Telephones (Gt. Britain), Limited.

RENOLD CHAINS, LIMITED—In order to create 2,000,000 £1 shares and to effect the one-for-two scrip issue detailed two weeks ago, an extra-ordinary meeting is called for March 29.

GAS PURIFICATION & CHEMICAL COMPANY, LIMITED—The company has withdrawn its offer for the capital of Sydney S. Bird & Sons, Limited, electrical engineers, etc., of Poole (Dorset).

FLUIDRIVE ENGINEERING COMPANY, LIMITED, fluid transmission engineers, etc., of Isleworth (Middx)—Ordinary dividend for the year ended September 30, 1959, is being raised to 12 (10) per cent.

WHARTON CRANE & HOIST COMPANY, LIMITED—The final is raised by 5 per cent. to 15 per cent. to make 20 (15) per cent. for 1959. A two-for-five scrip issue is proposed. Profits, after tax, were £37,219 (£35,398).

CAMBRIDGE INSTRUMENT COMPANY, LIMITED—The net profit for 1959 was £256,965 (£216,515) and the dividend is 12½ (11½) per cent., tax free. A first quarterly dividend of 4 per cent., less tax, was declared on account for 1960.

GLOUCESTER RAILWAY CARRIAGE & WAGON COMPANY, LIMITED—Interim ordinary dividend for the year ending May 31, 1960, is being cut from 5 per cent. to 3½ per cent. and is payable on April 1. The last final payment was 10 per cent.

WILLENHALL MOTOR RADIATOR COMPANY, LIMITED—The dividend is raised from the equivalent of 15 per cent. to 17½ per cent. on capital doubled by a scrip issue, with a final of 12½ per cent. Profits expanded to £195,521 (£128,095).

CLAYTON DEWANDRE COMPANY, LIMITED, motor engineers, etc., of Lincoln.—A sharp recovery was made in 1959 and the dividend equivalent is 2½ per cent. higher at 12½ per cent., with a 10 per cent. final on a capital doubled by a scrip issue.

HUMBER GRAVING DOCK & ENGINEERING COMPANY, LIMITED—Arrangements have been made by Baring Bros. & Company, Limited, to place at £98 per £100 nominal stock, £500,000 of the company's 5½ per cent. "B" first mortgage debenture stock 1983-90.

ADVANCE COMPONENTS, LIMITED—Profits amounted to £50,543 compared with £29,988 for the previous year. The dividend is 15 per cent. for the year ended January 2, 1960, against 12½ per cent. forecast when the company was made public last November.

C. & J. HAMPTON, LIMITED, toolmakers, of Sheffield—Manufacture of Record tools is to begin soon in Australia. Agreement has been reached with Ralph McKay, an Australian public company to form a new company—Hampton-McKay Pty., Limited—to carry out the project.

METAL INDUSTRIES, LIMITED—Resolutions were passed on Thursday of last week, altering the articles and capitalizing part of the share premium account in a free preference issue to the holders of the 5 per cent. and 3½ per cent. preference stock as compensation for the alteration to their rights.

INSTANT STARTER ENGINEERING COMPANY, LIMITED—For the purpose of receiving the shareholders' committee report into the affairs of the company, an extra-ordinary meeting has been called for March 21. This is in accordance with the terms of the resolution at the annual meeting last December.

HENRY NORRINGTON & SON, LIMITED, agricultural engineers, etc., of Exeter—Group net profits for the

year to September 30, 1959, were £18,673 (£14,517) and dividend 22½ (17½) per cent. Net current assets were £104,488 (£96,713). The directors report that there are indications of another satisfactory year's trading.

E. K. COLE, LIMITED, electrical, electronic, and radio engineers, etc., Southend-on-Sea (Essex)—The interim is maintained at 7½ per cent., but is on capital as increased by a one-for-three "rights" issue. At the time of the issue a total dividend of not less than 20 per cent. on the increased capital was forecast for 1959-60.

SUPER OIL SEALS & GASKETS, LIMITED—As forecast, the final dividend was 12 per cent. on capital increased by 10 per cent. scrip issue and a one-for-three rights issue, making 18 per cent. for 1959 (16½ per cent. equivalent, including 2½ per cent. special interim). The net profit was £146,390 (£115,624) after tax of £143,455 (£136,210).

BROWN BROS., LIMITED, motor accessory makers, etc., of London, E.C.2—Final dividend of 13 per cent. is recommended, making 17½ per cent. against 15 per cent. Group profits were £453,755 (£397,791), after tax. Because of the continuing expansion of the business, the directors are raising some £735,000 new funds by a one-for-six rights issue of 326,880 new £1 ordinary at 45s. each.

POLLARD BALL & ROLLER BEARING COMPANY, LIMITED—The final divided of 20 per cent. makes a 25 per cent. total for 1959 on a capital increased by a one-for-four scrip issue and represents a 7 per cent. increase over 1958. It is proposed to make a further one-for-four scrip issue to holders registered on March 28. Group profits expanded to £514,940 (£371,121) and the net profit is £279,830 (£152,738).

H. W. LINDOP & SONS, LIMITED, malleable ironfounders, of Walsall (Staffs)—Trading conditions show a considerable improvement, compared with the previous year, state the directors. An interim dividend of 6½ per cent. on account of the year ending June 30, 1960, is announced. The interim dividend rate was cut to 3 per cent. for 1958-59, but the total was maintained at 23 per cent. with an increased final.

ANDERSONS RUBBER COMPANY, LIMITED—The dividend due on March 31, on the "A" and "B" preference shares will be paid from reserves, a loss having been incurred during the trading year ended January 19, 1960. A full statement is in the course of preparation and will be posted to shareholders in the course of the next few days. Pending receipt of this statement shareholders are advised to retain their shares.

JOHN BOLDING & SONS, LIMITED, brassfounders and engineers, etc., of London, W.1—Profits permitting, the board intends to raise the interim dividend to 5 (2½) per cent. so as to improve the balance between the amounts paid as interim and final dividends. This, however, should not be taken as implying any increase in the total annual dividend. So far as the current year is concerned, order-books present an encouraging picture.

MATHER & PLATT, LIMITED, electrical, textile, hydraulic, and fire protection engineers, of Manchester—Group net profit attributable to the parent for 1959 is £850,751 (£712,022) and the dividend is 11½ (10¾ equivalent) per cent. Decrease in the company's profit margins was due to increased competition, states the chairman, Mr. L. E. Mather, but there are encouraging signs of increased business prospects in several parts of the world.

PADLEY & VENABLES, LIMITED, constructional engineers and manufacturers of tool steels and pneumatic tools, etc., of Dronfield, near Sheffield—With an order-book at as high a level as at any time in its history, the company has made a good start in the current year, states the chairman, Mr. E. W. Senior. The group net profit for 1959 was £83,928 (£68,270) and the dividend is increased to 24 (20) per cent. A 100 per cent. scrip issue is proposed.

BIRFIELD, LIMITED, general engineering supplies, of London, W.1—One-for-one scrip issue is announced and a 10 per cent. dividend is forecast for 1960, against the equivalent of 7½ per cent. After tax of £592,322 (£977,281), net profit dropped to £369,611 (£502,614). This was mainly due to unremunerative prices for propeller shafts, considerable development expenditure on new projects, and losses, now ceased, by certain subsidiaries. Sales, however, increased from £4,540,000 to £5,748,000.

AMALGAMATED ANTHRACITE HOLDINGS, LIMITED—As a result of an offer recently made to acquire all the ordinary capital of Allied Coal & Shipping, Limited, an extra-ordinary meeting has been called for March 28, to consider sub-dividing the £1 ordinary into 5s. shares and to amend the articles. If the offer becomes fully effective, the total consideration will be £22,500 in cash and the allotment of £180,000 nominal in ordinary stock, ranking in all respects *pari passu* with the existing ordinary.

HALL-THERMOTANK, LIMITED—Group profits for the year ended September 30, 1959, amounted to £930,416 (£840,678), before tax of £549,516 (£461,000). The 10 per cent. dividend is as forecast. The chairman, Mr. I. M. Stewart, says there are plans for increasing the range of group products and also for taking advantage of certain new technical developments in Europe and the US. Provided there are no major upsets, trading results for 1960 should certainly be no less favourable than last year, he says.

BARROW HEPBURN & GALE, LIMITED, manufacturers of rubber conveyors and belting, etc., of Mitcham (Surrey)—The company has agreed to acquire the whole of the share capital of Colloids Incorporated, of New Jersey, USA, a firm specializing in the manufacture of a synthetic sizing material for the textile industry, which Barrow Hepburn has manufactured in the UK under royalty for over two years. The purchase, which is in the order of £225,000, will not necessitate any immediate issue of further capital.

WM. PARK & COMPANY FORGEMASTERS, LIMITED—The directors announce that of the issue of 1,100,000 ordinary shares of 2s. each at 4s. per share, 1,082,100 shares have been accepted by shareholders on the provisional allotment letters. Applications from nearly 1,100 shareholders for excess shares totalling over 800,000 shares, have been allocated on the following basis:—Under 50 shares, in full; 50-30,000 shares by ballot, successful applicants receiving 50 shares each. One application for 30,000 received 65 shares.

THOS. W. WARD, LIMITED, iron, steel, and scrap merchants, etc., of Sheffield—Implementation of the proposals for the one-for-one scrip issue has been delayed pending a decision by legal advisers on certain related proposals concerning employees' shares. The points have now been resolved and it is hoped to convene the necessary meetings by June 30. Profits for the six months to December 31, 1959 were maintained on a similar level to those for the last financial year to June 30, 1959. The 5 per cent. interim is maintained.

B.T.R. INDUSTRIES, LIMITED, engineers in rubber and thermoplastics, London, S.W.1—Immediate results of the company's heavy construction and expansion programme have placed the group, as regards future prospects, in a stronger position to meet the competitive conditions which must be expected in the future. Some

new developments may be expected to contribute usefully to the group profit which for 1958-59 fell from £348,120 to £328,953, after a substantially reduced tax charge. The dividend is reduced by 2½ per cent. to 12½ per cent.

WOODHOUSE & RIXSON, LIMITED, forgemasters, etc., of Sheffield—A one-for-one scrip issue is proposed. Trading profits, etc., for 1959 declined to £156,675 (£202,562). After tax of £57,715 (£87,665), net profits were £61,095 (£77,720). The dividend is held at 10d. per 2s. 6d. stock unit. The chairman, Mr. S. E. Baker, reports an increase in orders during the latter part of the year, enabling the company to increase production of forgings. At present, the company is working full time for smaller forgings, but demand is still poor for heavier work.

WARNER & COMPANY, LIMITED, manufacturers of special pig-iron, etc., of Middlesbrough—A final dividend of 35 per cent. and a bonus of 20 per cent., makes 60 per cent. for 1959, compared with 20 per cent. (including 7½ per cent. bonus) for the previous six months. The net profit is £78,434 (£23,559) for the year, after tax of £75,000 (£24,000). The directors regard the profit for the past year as exceptional and recommend a bonus payment in addition to the final. Current profits are not expected to reach the same level because of recently increased costs.

HATTERSLEY (ORMSKIRK), LIMITED, engineers, iron and non-ferrous founders, etc.—A wholly-owned subsidiary—Hattersley (Canada) Limited—has been formed in Canada in connection with the creation of an organization to distribute products in Canada and the USA. The company's subsidiary, Beck & Company (Meters), Limited, has acquired additional production facilities through the purchase of all the share capital of four small private companies, Parkwood Engineering Company, Limited, Parkwood (Pumps), Limited, Parkwood (Components), Limited, and Parkwood Machinery Sales, Limited, for £67,500.

BROOKE TOOL MANUFACTURING COMPANY, LIMITED, of Birmingham—For the year ended September 25, 1959, group net loss was £14,245 (profit £44,927) and there is no dividend (6 per cent.). The chairman, Mr. A. G. B. Owen, says that since last December the rate of order intake has been rising quickly and now the Perry Barr factory has an order-book to keep it fully occupied for the whole of 1960. Some design and development costs have still to be borne and Perry Barr is unlikely to produce a profit in this financial year. The Greet factory is now operating profitably with a full production programme.

Changes in Export Licensing Control

EXPORT licensing changes are announced by the Board of Trade, resulting from routine revisions of the international list in the Co-ordinating Committee of the Paris Consultative Group.

Control is removed from cobalt compounds, diphenylamine, petroleum-based hydraulic fluids, and machines capable of milling aircraft spars. The scope of control is reduced for forging hammers and grinding machines. Control is imposed, to destinations other than in the Commonwealth, Eire, or the USA, on metal pipe or tubing covered with polytetrafluoroethylene or polychlorotrifluoroethylene.

Liability to export licensing is redefined in the case of telemetering and telecontrol apparatus, electromagnetic wave-absorbing materials, metal rolling mills, and certain metal working machines.

Glover & Main Factory Reorganization

STEPS entailing considerable redeployment of plant are contemplated by the Glover & Main, Limited, group in order to achieve economy in production and to make provision for greater future output. The entire production of gasmeter components, hitherto undertaken by Thomas Glover & Company, Limited, at Edmonton, has, during the last four months, been moved into the three factories of Meters, Limited, in the Oldham and Manchester districts. A new centralized administrative and research building is being planned on the Oldham site.

The meter assembly shop at Edmonton will remain, but Thomas Glover's factory at Edmonton has been handed over to R. & A. Main, Limited, which is transferring into it its refrigerator production. The most modern mechanized equipment and plant is being installed.

Administratively, Thomas Glover & Meters, Limited, will merge into one during the current year, but to facilitate co-ordination Mr. G. Barlow has already been appointed managing director of both concerns.

Preliminary steps are also being taken to amalgamate the production of the two companies in the group that manufacture appliances for heating water by gas—Main Water Heaters, Limited, and Morley Products (Padiham), Limited—into one unit in a new 160,000-sq. ft. factory at Padiham. Mr. W. K. Tate, previously managing director of Thomas Glover, will become managing director of the new joint company when this is formed later in the year.

Anti-corrosion Firms Pool Resources

FIXED assets and trade mark of Corrosion Proof Products, Limited, have been acquired by Corrosion Technical Services, Limited, Brentford (Middx), in association with Soil Mechanics, Limited, London, S.W.3. The technical staff of Corrosion Proof Products has also joined the company.

With the financial backing now available, Corrosion Technical Services plans to extend its activities in the field of corrosion engineering and specialize in the manufacture of chemical-resistant cements and membranes, floor-tiling and plant linings.

The range of these products will continue to be marketed under the trade mark "Corro-Proof."

All-round Increase in Massey-Ferguson Exports

ABOUT one-third of Britain's record-breaking export total of £105,000,000 worth of agricultural machinery last year was supplied by Massey-Ferguson. Business with "Outer Seven" countries accounted for 23 per cent. of the company's total exports from Britain of agricultural machinery, an increase in tractors alone of 11 per cent. on the previous year.

The greatest increase in this group was in Denmark, where about 5,000 tractors were exported last year—56 per cent. more than in 1958. Dollar earnings from tractors and components manufactured in Coventry were $22,000,000, an increase of 32 per cent.

Appointments

Durham NCB Area Post for Mr. F. K. Robson

NEW deputy production manager (planning) for No. 1 (North-East Durham) Area of the Durham Divisional Coal Board is Mr. F. K. ROBSON, planning engineer in this Area since 1957. He succeeds Mr. C. G. Widdas, who was recently appointed Durham Divisional deputy production director (planning).

Mr. Robson, who is 50, began his mining career at Seghill Colliery and later held posts as undermanager and manager of collieries in Northumberland and Durham and then as assistant group manager (planning) in the No. 1 Area.

Mr. JOHN G. DAVIES has been appointed general sales manager of Pirelli-General Cable Works, Limited, London, N.W.1.

Mr. A. B. ADAM, secretary for the past 27 years of Johnson & Phillips, Limited, manufacturing electrical engineers, etc., of London, S.E.7, retired on Tuesday. He is succeeded by Mr. N. D. Mathie.

Mr. C. F. H. CUFLEY has been appointed shipping adviser to International Minerals & Chemicals, Limited, the London subsidiary of the International Minerals & Chemical Corporation, of Stokie, Illinois.

Mr. JAMES L. WEIR has been appointed Sheffield area representative of the Clyde Alloy Steel Company, Limited, Motherwell. Mr. Weir has been with the firm for more than 21 years and was formerly in charge of the tool steel department.

Mr. HARRY ROBINSON has been appointed training officer for Broomhill and Hauxley collieries (Northumberland). Mr. Robinson, who is 58, began work underground at Broomhill 44 years ago and has been a deputy overman for 30 years.

Mr. K. M. COLE has been appointed secretary to Leicester, Lovell & Company, Limited, makers of foundry resins, of Southampton, in succession to Mr. H. A. Collinson, who has resigned that position but continues as managing director.

Mr. H. C. HINDER, southern area sales manager of I.T.D., Limited, manufacturers of mechanical handling equipment, of Birmingham, has been appointed export sales manager and Mr. JOHN LOWE, northern areas sales manager, is now home sales manager.

Mr. R. GORE has been appointed to the newly-created post of facilities manager of F. Perkins, Limited, diesel engine manufacturers, etc., of Peterborough. He will be responsible for planning, plant, tool room operations, industrial engineering, and safety.

Mr. C. I. RUTHERFORD has been appointed production director of the fibres division of Imperial Chemical Industries, Limited, with effect from April 1. He succeeds Mr. W. F. Osborne, who is retiring after 34 years' service with the company and its predecessors.

First area managers for Romac Industries, Limited, makers of motor and cycles accessories, etc., of London, N.W.9, have been appointed from the company's sales representatives. They are:—Mr. PETER BLAKE (south-west area), Mr. JACK MILNER (Midlands), Mr. FRED HEPWORTH (north-east area), and Mr. LEN STAAL (north-west area).

Mr. O. D. GWILLIAM has been appointed to the new post of assistant general manager of Foster Yates & Thom, Limited, heavy precision engineers and boilermakers, etc., of Blackburn. He will act as assistant to Mr. R. Lucas, the company's general manager. The post has been created because of increasing expansion and heavy industrial commitments.

Five new appointments have been made in the North-Eastern Divisional Coal Board. In No. 1 (Worksop) Area, Mr. C. H. SMITH is appointed marketing manager. Mr. J. HAWLEY becomes deputy production manager (operations) of No. 4 (Carlton) Area, and the new marketing manager of No. 7 (Wakefield) Area is Mr. J. W. E. BARWICK. In No. 8 (Castleford) Area, Mr. H. ALLEN is appointed safety engineer and Mr. C. DICKEN central workshops manager.

Mr. A. A. WAKEFIELD, industrial relations officer for the Cannock Chase Area of the West Midlands Divisional Coal Board, will succeed Mr. E. T. Switsur, industrial relations officer for the Warwickshire Area. Mr. Switsur is retiring at the end of the month. From 1941 until he was appointed to his present post in 1951 Mr. Wakefield was NUM branch secretary at Kingsbury and Dexter collieries (Warwickshire) and previously had worked underground at the face and as a deputy in collieries in the county.

Mr. E. J. HUDSON has been appointed divisional manager of the general services division at Swindon of the Plessey Company, Limited, electronic and instrument manufacturers, etc., of Ilford (Essex). Mr. Hudson, who was with Brush Electrical Engineering Company, Limited, and Jackson Industries, Limited, before he joined the Plessey Company as group cost controller last year, is a member of the British Institute of Management and a past director of studies for BIM management courses.

Mr. A. B. LIDDERDALE, formerly member of the cables group board and deputy to the managing director of Telegraph Construction & Maintenance Company, Limited, and a director of Toolpro, Limited, has been appointed assistant to the chairman of Arusha Industries, Limited. Mr. L. INGRAM, formerly assistant general sales manager of Chloride Batteries, Limited, has been appointed group sales manager and Mr. A. J. SMITH, until recently general works manager of the Glacier Metal Company, Limited, becomes the group industrial engineer.

Mr. DAVID A. JENKINS, deputy coke ovens manager at the Ebbw Vale Works of Richard Thomas & Baldwins, Limited, has been appointed to succeed Mr. R. Raby as manager of the coke ovens at the company's Redbourn Works at Scunthorpe. Mr. Raby's appointment as coke ovens manager at the new Spencer Works was announced recently. Mr. Jenkins joined RTB at Ebbw Vale in 1940. As technical assistant to the coke ovens manager, he was responsible for the domestic gas supply to the town of Ebbw Vale before the Wales Gas Board took over the supply from the company. He became assistant manager (technical) in June, 1955, and deputy coke oven manager in May, 1958.

Wingerworth Plant RV Reduced

AFTER five years of negotiations between the National Coal Board and rating valuation officers, the rateable value of the £10,000,000 coal carbonization plant at Wingerworth (Derbyshire), has been fixed at £120,000. Industrial concerns normally pay rates on 50 per cent. of the net rateable value, so Chesterfield Rural Council, in whose area the plant lies, may benefit by about £50,000 a year.

The board had appealed against the original assessment of £144,000.

IRON AND STEEL TRADE

BRITISH steel is serving home industry well both in quantity and quality, and by raising exports to record heights it is making a substantial contribution to the primary purpose of UK economic policy—the improvement of the nation's external trade balance. The margin, however, between the immediate maximum outputs of UK steel plants and current demand must be very narrow and, although outputs have been raised—in some instances to higher levels than was thought possible—the rate of expansion must be slowed down until new equipment is ready for operation.

Pig-iron

The outstanding performance of the makers of pig-iron is the raising of production to its highest peak with a smaller number of blast furnaces in service. This, of course, has been made possible by the progressive substitution of bigger and more modern blast furnaces for some of the older units of small capacity and the closer attention devoted to the preparation and beneficiation of ores prior to furnace use.

The further growth of pig-iron manufacture is clearly indicated. Consumption in the steel plants continues to rise and the acceleration of activity in the foundries connotes a heavier demand for high-phosphorus grades.

Ferro-alloys

The demand for most items continues to be at a good level, with ferro-silicon continuing to attract strong support. The call on ferro-tungsten is quite steady at present, and the price also remains unchanged. Both the high- and low-carbon grades of ferro-chrome are in steady request, and calcium silicide is fairly active. There is a good demand for supplies of ferro-manganese and silico-manganese.

Moderate support is given to ferro-niobium, and ferro-titanium is quite active. Steady to active attention is given to ferro-molybdenum and ferro-vanadium.

Semi-finished Steel

The pressure for slabs for the sheet mills and billets for the re-rolling mills is unrelenting. Shortages have been overcome in some measure by larger imports from western Europe, but this is no more than a temporary expedient.

The completion of more billet mill capacity is in sight and its attainment promises to bring total supplies from home sources into approximate alignment with industrial requirements.

Finished Steel

Makers of finished steel products, in the popular idiom, "have never had it so good." There are changes in the general pattern of the market. The decline in specifications for colliery arches and railway material in the form of heavy steel rails, axles, and tyres has not been arrested, but these are the only dull spots.

Supplementary imports of sheets are urgently needed to meet the needs of the motor industry and the rapid expansion of the demand for structurals has far exceeded the most sanguine expectations. Some part of the increase is attributed to stockpiling, and possibly to duplication of orders from consumers who fear shortages. Whatever the reason the heavy rolling mills are assured of full employment for several months ahead.

MANUFACTURERS EQUIPMENT COMPANY, LIMITED—Mr. W. G. Friggens has been appointed a director.

Australian Steel Demand Outstrips Production

BECAUSE the demand for Australian steel has outstripped production, most of the export market has been temporarily given up and consumers requiring prompt delivery may have to rely partly on imported steel until the production gap can be bridged, according to an interim report issued by Broken Hill Proprietary Company, Limited, Melbourne. The company's vast expansion programme may now be brought into operation earlier than previously planned.

In the past six months there had been a most striking change in Australian demand for steel, says the report. Even with record production currently at 3,500,000 tons of ingot steel a year, the group could not supply Australia's needs. The sharp increase in steel demand, both at home and abroad, meant that Broken Hill Proprietary was now quoting longer deliveries for many types of steel. Except in isolated instances, the company has had to withdraw from the attractive export market.

To meet the growth of Australian needs the company had continued an extensive and costly programme of expansion. Capital expenditure for the six months to November, 1959, totalled £A13,000,000. Capacity to produce steel had improved by half in the last three years, adding more than a million tons to the industry's annual capacity.

Production capacity at the end of 1958 and early last year was in some directions in excess of home demand and the company was able to obtain export business.

Holman Bros. Gifts for Agadir Relief

BRITISH pneumatic tools and an air compressor to help clear ruined Agadir have been given to the Moroccan Government by Holman Bros., Limited, Camborne (Cornwall). The machines were flown to Agadir on Saturday.

The offer was made through the Moroccan Embassy in London, which then arranged with the Admiralty and the US Air Force to fly the machines out to Agadir from Culdrose Royal Naval Air Station in Cornwall.

The equipment included 10 Holman road breakers and a Holman 160 c.f.m. diesel-driven portable air compressor. All machines were supplied with the necessary ancillary equipment and a technician from the company's agents in Casablanca visited Agadir to supervise their operation.

"Noisy Trumpetings" of Coal-mining Critics

HINTING that further development of the mining department of the North Staffordshire Technical College, Stoke-on-Trent, was being planned and would make it one of the most important in the country, Ald. J. A. Boon, chairman of the city's education committee, said on Thursday of last week that the burden upon ratepayers of running technical colleges was likely to become heavier. He believed that in a very short time the Government would have to make bigger grants for technical education if local authorities were to maintain the present rate of expansion.

Ald. Boon was presiding at the prizegiving of the mining department of the college at which the prizes were presented by Mr. H. J. Widdowson, general manager of the North Staffordshire Area of the West Midlands Divisional Coal Board.

Referring to comment about the mining industry from less responsible elements in the community and the popular Press, Mr. Widdowson said: "These noisy trumpetings, correctly appreciated by right-thinking people, must, however, have an effect on morale within the industry." Coal-mining had had to adjust its sights to the new circumstances and he believed that the method of coal stocking coupled with controlled recruitment represented a courageous decision by the Coal Board.

Compared with some Areas, output in North Staffordshire would not have to be controlled to nearly the same extent as elsewhere and it was doubtful with the numbers of men now in the industry whether they would be able to produce the tonnage they had been charged to mine this year, Mr. Widdowson continued. He was, therefore, confident that the industry, with its vast national resources, would continue to provide a firm and satisfying career for all who had the will to work. It was imperative that they should make themselves as technically capable as possible to enhance the contribution they could make.

Other speakers included Mr. L. D. Rhydderch, HM Senior District Inspector of Mines and Quarries, and Mr. W. H. Jones, president of the North Staffordshire Area of the NUM.

Mines Mechanization Training Centre to Close Down

WHEN students, having completed the final course, leave on March 25, the Mines Mechanization Training Centre at West Bar, Sheffield, is to close down. The centre, the only one of its type in the world, opened in 1944, and 20,741 pupils have taken courses there. An average of about 300 students training at a time was reached, but the number has now dropped to 50. Most of the staff, at one time about 80, have already been appointed to training establishments elsewhere.

The centre started with 40 students and four instructors, with "lease-lend" mining machinery from America among the initial equipment. The NCB flag which flies from the building will be hauled down by one of the youngest students at a brief ceremony on March 25.

Mr. H. Wilson, manager of the centre, went there in 1944 as assistant manager. He will stay on directing winding-up operations until his retirement in June.

Methane Pioneer to End Trial Shipments

LAST of her series of seven trial voyages across the Atlantic will be made this month by the Methane Pioneer, a prototype tanker owned jointly by the Gas Council and Constock International Methane, Limited, of America. Purpose of these trial shipments of liquid methane from the United States to Britain is to assess the practicability of transporting liquefied natural gases over long distances.

When the trials finish, more than 14,000 tons of methane will have been delivered to the North Thames Gas Board's marine terminal on Canvey Island in the Thames. It has been kept in special containers and the "boil-off" pumped to the board's Romford works to be modified into town gas with the correct calorific value. In its natural form methane has about double the calorific value of town gas, and each shipment of just over 2,000 tons was equivalent to 5,000 tons of coal in thermal content.

Although the Gas Council has described the trials as "very successful," the economics of whether the gas industry can use a new primary fuel to reduce the price of gas have not yet been fully worked out. A report on the experiment is to be presented to the Minister of Power in a few months' time.

Presbytery Condemns NCB Pit Closures

RESOLUTION condemning the National Coal Board's pit closure programme and the Government's fuel policy was passed at a recent meeting of Kirkcaldy (Fife) Presbytery. The resolution, submitted by the Rev. D. Page, called upon the Government to consider the use of the country's natural fuels as opposed to oil.

The Rev. J. M. Davidson said that until a year ago miners in Fife had been earning deservedly big wages. Because of the recession in the industry, they were now moving elsewhere. Another speaker, the Rev. J. Welsh, who seconded the motion, said that the speed of the cutback in coal production was one of the worst aspects of the case. There were already plans, he said, for many more pit closures by 1965.

The resolution was sent to the Minister of Power (Mr. Richard Wood), the Secretary of State for Scotland (Mr. John Maclay), and the Church and Nations Committee of the Church of Scotland.

LESS-SMOKE PLANT FOR SMOKELESS FUEL

NEW process which cuts down the amount of smoke produced during manufacture of smokeless fuel has been introduced by the National Coal Board at its Grassmoor (Derbyshire) plant for the production of "Warmco."

A NCB spokesman said that some methods of producing smokeless fuel themselves caused large amounts of smoke to pour out of the plant. The Grassmoor coke oven had now been fully converted to the new process and conversion had reached the halfway stage at the Hardwick coke ovens a few miles away.

THE COAL TRADE

VAGARIES of the weather have been reflected in the demand for household qualities and, to a lesser extent, for central heating. During the spell of warmer weather merchants in some parts were able to relieve the pressure on transport, but the respite was short-lived and demand is back again to its former intensity. If not exactly overcome, the railway transport problem appears to have eased somewhat and the employment of road transport, though causing prices to firm, has helped to get supplies from pithead to the proper place—the merchants' yard.

WEST MIDLANDS

Shortage of railway wagons has meant the movement of large tonnages of coal by road. Demand for house coal is far above normal and despatches from collieries have been exceptional. Merchants have not much choice of quality, but those within reasonable reach of collieries are not short of coal. Complaints by householders are rare and most merchants are able to serve their customers well. Road supplies add to merchants' costs and there is a tendency for retail prices to stiffen, but prices have generally remained at the winter level. Despite the milder weather now, the demand is still strong. Moderately-priced coals are in keen request, though house nuts are harder to sell. Labour shortages are increasing, but overtime working is helping to keep the coal moving. Premium grade fuels, still difficult to acquire, are becoming even more popular with the householder.

A heavy demand exists for all domestic boiler fuels. Anthracite stove nuts and beans are the most difficult descriptions, though Welsh dry steam nuts are also scarce. Orders for coke have been too heavy for merchants to deal with, but supplies are adequate and delays are not serious. Stocks are substantial.

Although increased industrial activity and heavy space-heating load at factories has meant swollen demand for all types of industrial coals, merchants have fulfilled orders promptly. Manufacturers have thus not had to draw much on reserve stocks. Supplies to public services are also maintained at almost contract rates and stock lifting has been low.

The market for hard coke has strengthened in all sections. Blast-furnace coke remains strongest, however, and there has been a welcome increase in demand for general engineering qualities. There is still much spare tonnage of hard coke nuts. Foundry coke is also strong and buyers are not able to choose as freely as before.

Unemployment Rise in Engineering

UNEMPLOYMENT in the engineering and electrical goods industries rose by 2,684 to 22,246 in the month ended February 15, according to figures issued by the Ministry of Labour. Almost the whole of this increase was among those temporarily out of work. The number out of work in shipbuilding and marine engineering industries (13,021) dropped by 1,151.

In the mining and quarrying industries, unemployment remained stable at 7,961, an increase of 17 on the January figure. There were 8,040 (314 fewer) people out of work in metal manufacturing industries, and in other metal goods industries 7,123 unemployed people, an increase of 60. Unemployment in the vehicle industries rose by 217 to 6,258.

Railway Wagon Company Merger Proposed

OFFER, which involves an exchange of ordinary stocks into a new holding company and which could form the basis for a merger has been made by Charles Roberts & Company, Limited, makers of road and rail vehicles, axles, springs, etc., of Horbury Junction, near Wakefield, to the Birmingham Railway Carriage & Wagon Company, Limited. The two companies are among Britain's largest railway carriage and wagon makers.

The new holding company's ordinary capital would be in 5s. units and the proposed exchange basis would be three units for each £1 in the Birmingham company's £990,975 capital, and one for each 5s. unit in Charles Roberts's £1,398,150 ordinary.

The board of Birmingham Railway Carriage & Wagon states that it has considered the offer, but feels that before it is justified in making any recommendation it should obtain an up-to-date valuation of assets. The necessary steps are being taken.

Police Check on "Sabotaged" Mine

POLICE are investigating alleged sabotage which is threatening lives and has stopped work at a private coal mine at Plains, near Airdrie (Lanarkshire). No work has been done at the mine since March 1, when the electric hauling gear was destroyed during the night. This is the first time work has been brought to a standstill at Arbuckle Pit No. 15 since the incidents began nine months ago.

During that time someone:—Bared high voltage wires and attached them to the bogie rails which could have proved fatal when the power was switched on; destroyed an expensive boring machine and smashed pitprops making the roof collapse and bury £400 worth of pumping equipment.

Mr. Pat Tobin, 28-year-old part-owner of the mine, said: "Someone is deliberately setting out to wreck the mine started by my father and me. But they won't stop us."

FOLLOWING THE COMPLETION of a gas turbine for the Pakistan Water and Power Development Authority, Richardsons, Westgarth & Company, Limited, Wallsend-on-Tyne, is building a second which will be installed at Hyderabad. The two turbines have been built to the design of Brown-Boveri, Limited.

Non-ferrous Metals

Copper Price Speculation

COPPER is relatively firm in London, but demand is patchy and the uncertain position of the American price structure, together with the continued weakness of Wall Street, has made the market in London sensitive. On the surface demand is sufficient to justify the present price for cash copper and the fact that copper stocks fell a further 535 tons to 3,072 tons at the end of last week gives added point to this comment. Yet, with the American price for No. 2 scrap at only 25 cents a pound all indications are that the US customs smelter price must be reduced soon.

The scrap price suggests a custom smelter price of around 31 cents a pound, but it is hardly likely that this price will be reduced 4 cents from its present level of 35 cents a pound. General opinion favours the belief that it will be reduced, in the first instance, by 2 cents to bring it into line with the producers' price of 33 cents a pound.

The US copper market is not experiencing brisk trading conditions and demand continues to be below expectations. Much of the present malaise is attributed to the poor showing recorded on Wall Street. If the Stock Exchange trend is reversed it could have the very beneficial effect on demand for non-ferrous metals.

A report from Chile that President Eisenhower told the Chilean President that there was no intention of making releases from the US stockpile had little effect on the markets. This is because the wording of the statement was imprecise in so far as the US President did not make it clear whether he meant to include all the various stockpiles in existence. In any event, it would be an inopportune time to embark on such a course of releasing copper from any stockpile as from all evidence available it would appear that copper prices have a downward trend.

The tin market has been hesitant awaiting the outcome of the International Tin Council's meeting this week. The point at issue is whether the export quota will be changed from its present level of 36,000 tons a quarter. Although general belief is that it will not be changed, the price in London has been easing in front of the expected communiqué. This indicates either that there are some who feel that it will be increased, or that the buffer stock manager has been selling. In the UK, stocks of refined tin in LME warehouses rose by the appreciable total of 930 tons to 9,090 tons at the end of last week. In the US the price is below $1.01 a pound.

Lead has been quietly steady on both sides of the Atlantic. In London the price went to £75 17s. 6d. at the end of last week—its highest closing price since November, 1958. The quotation is holding around that level and demand is satisfactory. In the US the market is quietly steady and there is now some talk of the price being raised from its present level of 12 cents a pound in the next two or three months.

Zinc is quietly steady in London and quiet in the US, where demand from the automobile industry has fallen off slightly. However, world demand for the metal remains satisfactory and the East St. Louis spot price is unchanged at 13 cents a pound.

Official metal prices in London yesterday (Thursday) were:—COPPER, Standard: Prompt £253, forward £238 5s. TIN, Standard: Prompt £785 10s., forward £786. LEAD: Prompt £76, forward £75 2s. 6d. ZINC: Prompt £88 12s. 6d., forward £87 12s. 6d.

17th Century Records Find in Glasgow Foundry

OLD documents and records, some dating back more than 300 years, were found during the recent reorganization of foundry and office accommodation at the Springfield Steel Company, Limited, Glasgow. They have proved so interesting that the company has decided to incorporate them in a history of the iron and steel industry of Scotland.

The earliest recorded date is 1607, when Sir George Hay founded the Fassagh Ironworks on the shores of Loch Maree, using the vast oak forests at Letterewe as a fuel supply. Three years later King James VI granted him a patent for the manufacture of iron in Scotland. When, after a further 11 years, the fuel supply had presumably diminished, there was a patent registering "the misterie and arte of melting iron ewre and of making the same into cast works or barres with sea or pit coals in furnaces with bellows." This apparently marked the turning point of the industry in Scotland and a general movement into the Forth and Clyde valleys.

To increase the scope of the intended publication, Mr. Robert MacLeish, the company's public relations officer, would like to borrow any documents, letters, or pictures dealing with the Springfield Steel Company during the years 1870 to 1918. He would particularly like to find out why the foundry, standing at the junction of Springfield Road and London Road, is known locally as the "Pancake." Anyone with such information or documents, etc., who would be prepared to lend them for photographic copying is invited to notify Mr. MacLeish, at the Springfield Steel Company, Limited, 1323, London Road, Glasgow, E.1.

Scotland No Nation of Girners

DEFINITION of "to girn" is given by Webster as "to whine or snarl" and Mr. John Maclay, Secretary of State for Scotland, told the Scottish branch of the National Union of Manufacturers last Friday: "We really must avoid giving the impression, however inadvertently, that we are a nation of girners." He was speaking at the annual dinner of the branch and referring to those who complained that much of the production of the Ravenscraig steel strip mill of Colvilles, Limited, would be exported either to England or oversea.

Colvilles' plan to increase the initial capacity of the strip mill to 500,000 tons a year was "one of the best bits of news we have had recently" he said. Naturally the strip-using industries were wanted in Scotland as well but, he added: "Do not let us underestimate the vast importance of having that volume of production in Scotland.

"Even with the price-equating system the knowledge that the actual production takes place in Scotland will, I am quite convinced, over the years prove the type of encouragement to Scottish development that we have badly lacked for a long time."

THE LARGEST COAL CARGO shipped from the river Wear for several years has been loaded into the Portuguese steamer Alcoutin, which took aboard 7,500 tons of best Durham coal for Portugal. A total of 213,555 tons of coal was shipped from the Wear in January—an increase of 4,545 tons on the figure for January, 1959.

Personal

Institute of Metals Awards

OUTSTANDING contributions to metallurgy have been recognized by the Institute of Metals. The institute's Platinum Medal has been awarded to Prof. R. F. MEHL, head of the department of metallurgical engineering, Carnegie Institute of Technology, Pittsburgh, and the Rosenhain Medal for 1960 to Prof. NORMAN JAMES PETCH, William Cochrane Professor of Metallurgy, King's College, University of Durham, in recognition of his outstanding contributions in the field of physical metallurgy.

Whereas Prof. Mehl's work has been largely in the field of non-ferrous metallurgy, Prof. Petch has made careful studies of the structure of martensite, sustenite, and cementite. He has given his name to the Petch analysis of yield stress and fracture stress. In recent years his interests have been principally in dislocation theories of the yield flow and fracture of alpha-iron.

The institute's W. H. A. Robertson Medal and Premium for 1959 has been awarded to Dr. MAURICE COOK and Mr. E. SWAINSON, formerly chairman and assistant manager, respectively, of the technical department of the chemicals division of Imperial Chemical Industries, Limited, for their paper on "Arc Melting of Reactive and Refractory Metals."

Mr. RONALD HOLROYD, deputy chairman of Imperial Chemical Industries, Limited, will receive an honorary Doctor of Science degree at a Hull University Congregation on July 2.

Mr. SYDNEY BARRATT, chairman of Albright & Wilson, Limited, chemical manufacturers, of Birmingham, has been made an honorary Fellow of University College, London.

WING CMNDR. J. M. AITON, chairman and managing director of Aiton & Company, Limited, pipework specialists and ironfounders, etc., of Derby, has been elected president of the Derby and Derbyshire Chamber of Commerce.

Mr. J. S. ALLCARD, sales director of Easterbrook, Allcard & Company, Limited, manufacturers of engineers' small tools, etc., of Sheffield, left on Wednesday on a business trip to South Africa, Southern Rhodesia, Tanganyika, Italy, Switzerland, and Germany.

Following his appointment as chairman of the board of Imperial Chemical Industries, Limited, Mr. STANLEY PAUL CHAMBERS has resigned from the National Coal Board because of increased business commitments. Mr. Chambers has been a part-time member of the board for four years.

Mr. JOHN C. ROBSON has retired from the post of chief scientist for the Alloa Area of the Scottish Divisional Coal Board. Up to nationalization he was a chemist at Plean Colliery, Stirling. He was appointed chief scientist of the Central West Area, and later transferred to the Alloa Area.

Cllr. RICHARD CUNNINGHAM, who has worked at the Prince of Wales Colliery, Pontefract (Yorks), since 1931, has accepted an invitation to become Pontefract's 491st mayor. He has captained both the junior and senior ambulance teams at the colliery, and received the BEM in 1945 for courage in a pit rescue.

At a graduation ceremony to be held in July at Aberdeen University, the honorary degree of Doctor of Laws is to be conferred on Sir WILLIS JACKSON, FRS, president of the Institution of Electrical Engineers, and a director of Metropolitan-Vickers Electrical Company, Limited, and Sunvic Controls, Limited.

In succession to Mr. C. S. Brown, Mr. L. R. MILLIGAN, industrial relations director of the Scottish Divisional Coal Board, has been elected president of the Coal Trade Benevolent Association of Scotland. Grants totalling £1,508 were paid out to members of the association last year and donations amounted to £1,024.

On behalf of the Queen, Mr. Edward Heath, Minister of Labour presented the British Empire Medal to Mr. G. B. RICHARDSON on Wednesday. Mr. Richardson, a gas welder, has had 37 years' service with Ashmore, Benson, Pease & Company, Limited, makers of blast-furnace and gasworks plant, etc., of Stockton-on-Tees.

After a lifetime in the South Wales mining industry, Mr. EDDIE RICHARDS, chief surveyor (planning) in the No. 2 (Maesteg) Area of the South-Western Divisional Coal Board, has retired. Born in 1896 in the Rhondda, he is the son of the late Mr. D. Ll. Richards, who was manager of the Wyndham Colliery, Ogmore Vale, from 1906 to 1940.

Mr. T. H. B. WHITING, since 1946 head of the spares and service department of Aveling-Barford, Limited, engineers, of Grantham, is to become London director of the Aveling-Barford group. Mr. Whiting, who is 58, has been a director at Grantham since 1953. The company's London manager, Mr. C. G. Miller, formerly general sales manager at Grantham, is retiring.

Mr. STAFFORD BEER, head of the United Steel Companies, Limited, department of operation research and cybernetics, leaves at the end of April to lecture at the Systems Research Centre of the Case Institute of Technology, Cleveland, Ohio, and at Illinois University. His tour will be preceded by two BBC talks, the first of which was given on Wednesday, on "Thinking Machines."

Mr. ROBERT LESLIE HUNTER, a director of Allied Ironfounders, Limited, and associated companies, has been appointed to the Scottish Committee of the Council of Industrial Design. Mr. THOMAS G. COUGHTRIE, chairman and managing director of the Belmos Company, Limited, and Mr. PETER B. H. BROWN, director of Worthington-Simpson, Limited, have been reappointed to the committee.

Sir ALEXANDER FLECK, FRS, who retired from the chairmanship of Imperial Chemical Industries, Limited, recently, has been appointed president of the Society of Chemical Industry for 1960-61 in succession to Mr. E. J. Solvay. He will be installed at the annual meeting of the society at Bristol in July. Sir Alexander has received the Messel and Castner Medals of the society of which he has been a member since 1917.

Mr. J. WALLACE, undermanager at Langwith Colliery, since 1940, has retired after 50 years in the industry. Mr. Wallace joined the Staveley Coal & Iron Company, Limited, in 1909, and became a colliery official in 1921. In 1930, he joined the Sheepbridge Coal & Iron Company, Limited, at Langwith. He was appointed overman at High Hazel Colliery in 1934 before assuming his final appointment at Langwith.

Ald. GEORGE CLAVERING HALL, who at the age of 81 is still actively engaged as chairman and managing director of the Peterborough engineering firm of J. P. Hall & Sons, Limited, is to become a Freeman of the City of Peterborough. Since 1917 Mr. Hall has been head of the business, which was founded by his father nearly 60 years ago. He first became a councillor in 1927.

Sir STUART GOODWIN, chairman and managing director of Goodwin & Company, Limited, Sheffield,

president of the Neepsend Steel & Tool Corporation, Limited, and a director of many other companies, is to be installed during the first week of next term as the honorary president of the Sheffield University Students' Union. Sir Stuart, who will be the first holder of the office in nearly 20 years, has donated £90,000 to the university since 1958.

Mr. JOHN RYAN, vice-chairman of the British Institute of Management, was presented with the Gold Medal of the International Committee for Scientific Management at the International Congress of Scientific Management in Melbourne on Thursday of last week. Mr. Ryan, who was selected from the managers from 29 countries, is a Fellow of the International Academy of Management, president of the Institute of Sheet Metal Engineering, deputy president of the British Standards Institution, a member of the Grand Council of the Federation of British Industries, and a member of the councils of the British Employers' Confederation, the British Engineers' Association, and the British Tin Box Manufacturers' Federation. He is vice-chairman of the Metal Box Company, Limited.

BISRA Leads the Way in Fully Automatic Forging

WHAT is claimed to be the first fully automatic forging in the world was produced on Thursday of last week at the Sheffield laboratories of the British Iron and Steel Research Association. The achievement which was witnessed by visitors from the Yorkshire branch of the Institution of Mechanical Engineers marks many years of research by BISRA scientists. The forging undertaken was comparatively simple, but BISRA now plans to develop more complex types.

The basis of the automation is that a punch card is drawn up to fit the forging needed and to dictate the press motions. The forging press is set in motion by a push button. Many forges have already incorporated the earlier stages of this research and it is likely that much forging plant will be replaced now that the fully automatic stage has been reached.

This development saves fuel costs and labour as well as preventing heat loss.

Britain's Ability to Export Instruments

MR. D. F. HAYDOND, chief technical sales representative of Baird & Tatlock (London), Limited, who has just returned after a week's visit to Holland, states that British exporters of scientific instruments to the Continent have less to fear from German competition than is often assumed. He maintained that provided their service facilities are up to the mark, British manufacturers in this field can meet the Germans on price as well as quality.

During his visit, Mr. Haydond saw several Dutch concerns from among which his company will choose an agent in Holland.

PRODUCTION SHOULD begin later this year on a flail forage harvester at a new factory at Sherness (Kent) being established by the agricultural division of Allied Ironfounders, Limited. The harvester is based on a US patent and is a project in the UK of Mr. D. A. Young and Mr. R. S. Stevens of Lundell (Great Britain), Limited, in which Allied Ironfounders has acquired a 75 per cent. interest.

EMI Withdraws Bid for Henry Simon (Holdings)

BID made by Electric & Musical Industries, Limited, for Henry Simon (Holdings), Limited, was withdrawn on Wednesday. The decision by EMI was taken after it learned that the board of Henry Simon (Holdings) and Simon-Carves, Limited, had agreed to recommend the complete merger of their two businesses, which are the parents of a number of engineering companies known as the Simon Engineering Group.

The exact terms of the merger must await the final results, available to the directors by the end of the month. However, a new holding company will be created, inter-company shareholdings will be eliminated, cash surplus to the requirements of the new group will be withdrawn for the benefit of shareholders, and a more liberal dividend policy will be adopted.

Merger discussions were going on several days before the EMI proposal was issued at the beginning of the month. EMI bid one 10s. share and 5s. in cash for every Henry Simon (Holdings) 5s. share.

Asquith Machine Tool Corporation

CHAIRMAN of the Asquith Machine Tool Corporation, Limited, Halifax, Mr. Robert W. Asquith, says in his annual statement that he does not feel in any position to forecast results which would justify maintaining the 15 per cent. dividend paid for the year ended September 30, 1959. As announced, it is not intended to pay an interim for the current year.

Mr. Asquith says that with nearly half the financial year gone the picture is so far not encouraging. Considerable capital expenditure has been and is being made in enlarging and improving facilities to cater for the type of machines required by the engineering industry today. Because the order-book consists more and more of machines of a special nature and lengthy production times are involved, larger stock and work-in-progress are necessitated, with all the attendant costs.

Results of the 1958-59 group turnover, which as a whole was reduced, were disappointing, says Mr. Asquith. Group profits, as announced, fell from £815,105 to £563,475 before tax.

BICC to Concentrate Marketing Facilities

BECAUSE of the excess capacity which still exists in the cable industry, British Insulated Callender's Cables, Limited, is to take a further step in concentrating its marketing facilities. The manufacturing and marketing activities of the St. Helens Cable & Rubber Company, Limited, a member of the BICC group, are to be integrated with those of BICC as from June 1.

Cable manufacture will be transferred progressively from the Slough factory to other factories in the group and in the UK the company's selling activities will be combined with those of BICC. The company's business in mechanical rubber products will continue as at present until further notice.

JOSEPH CRAWHALL & SONS, LIMITED, wire rope manufacturers, etc., of Newark (Notts), have established a financial and trading relationship with the Bascom Rope Company, of the USA.

"Age of Coal" is Not Over: Mr. R. Kelf-Cohen

QUESTIONING whether the National Coal Board in its "Revised Plan for Coal" has appreciated fully the strength of the social revolution which is weakening the demand for solid fuels, Mr. R. Kelf-Cohen, writing in the March issue of the District Bank Review, believes the board is too optimistic in its estimates of future sales.

Mr. Kelf-Cohen, who is a former Under-Secretary, Coal Division, Ministry of Fuel and Power, maintains that the first half of the 1960s should be decisive for the future size of the coal industry. "It will be a different industry from that of the 40s and 50s," he writes.

"It will be more streamlined, with more mechanization working in fewer pits with fewer men. It should be able to dispense with the burden of uneconomic pits which have been such a potent factor in pushing up costs.

"Oil will continue to grow: so will electricity. Gas may be able to hold its own against oil, but may only be able to do so by using oil as its raw material for gas."

No one, Mr. Kelf-Cohen states, can say when, if ever, power from nuclear energy will be as cheap as power from conventional sources. The nuclear contribution in the 1960s will be insignificant and what there will be of it will be expensive. Ten years hence we should be able to decide whether a great expansion of nuclear generation of electricity is the right course for the 70s.

"In all these circumstances what should be the national policy on fuel?" the writer asks. "Coal is our most valuable indigenous asset and its use should be fostered—but not by hampering the use of alternative fuels."

In the fear of a shortage of energy in the 60s, Governments in the 50s went in for nuclear power station programmes on too vast a scale; they were absorbing much too much of valuable national resources.

If only a fraction of those resources went into research and development of the uses of coal, the national economy would receive greater benefit.

Turning to the Wilson Committee, which was set up by the Minister of Power to investigate chemical and other possibilities in the use of coal and whose report is expected in the next few months, Mr. Kelf-Cohen maintains that if the report is encouraging the Government should take vigorous action on it. As research on these lines needs drive and initiative, especially in the production of smokeless fuels, a special agency should be created for this purpose and endowed with handsome resources.

During the 60s scientific developments in the use of fuels will move forward everywhere with rapidity and Britain should not lag behind, especially in developing the uses of its only indigenous fuel.

Contrary to the common opinion, the writer states, the "Age of Coal" is by no means over. By 1970 there should be many uses of coal at present unknown. But, he insists, the background to this development should be freedom of choice for the consumer in his fuel requirements.

The KARL MARX COLLIERY, Zwickau, East Germany, where 123 miners died after an explosion and fire on February 22, resumed production on Monday.

BTC Chairman on Pithead Stocks of Coal

QUESTIONS about the apparent inability of British Railways to move stocks of coal from many collieries without inordinate delay were put to Sir Brian Robertson, chairman of the British Transport Commission, when he met members of the Parliamentary Labour Party's Fuel and Power Committee at a private meeting at the House of Commons on Wednesday night.

It is understood that Sir Brian attributed the delay to a shortage of men and machines to help in the speedy turn-round of the wagons when they were returned to the pitheads. He said there was no lack of wagons. Sir Brian referred to consultations which had begun between BTC officials and the National Coal Board to see if there could be a staggering of orders for supplies of coal so that there was a more even flow of traffic.

Earlier this week the Yorkshire branch of the National Association of Colliery Managers urged Labour MPs representing mining areas to use their influence in getting an improvement in rail transport.

Skilled Jobs Open to More School-leavers

SUBSTANTIAL increase in the intake of boys to skilled occupations during the next three years is the policy of 154 large public companies. This is the preliminary result of an appeal by Sir William Garrett, director of Monsanto Chemicals, Limited, and Metal Industries, Limited, and president of the British Employers' Confederation, in a letter pointing out that the number of school-leavers in the next three years would be about 20 per cent. higher each year than in 1958.

Another 62 companies replied that although they sympathized with the idea, they could not associate themselves with the precise terms of the letter.

A similar survey undertaken by the British Iron and Steel Federation showed that the industry would increase its apprentices by more than 20 per cent. in the next five years.

It has since been announced that the Government has decided to launch its own apprenticeship scheme as an example to those firms which have ignored repeated appeals to do their share in shouldering the burden of industrial training. Starting this summer, places will be made available in 14 Government training centres for apprentices. They will be given 12 months' general instruction in a limited number of crafts at the Government's expense and then graduate to complete their courses with sponsoring employers in the orthodox way.

VERDICT OF ACCIDENTAL DEATH was returned by a jury at the Boston (Lincs) inquest on Thursday last week, on Mr. Roy Smith (26), manager of the Boston Coal & Shipping Company, Limited, who was drowned on January 6, when his car plunged into the lock-pit at Boston dock. It was stated that Mr. Smith had gone to the dock late that night to meet a ship delayed by fog, and that he appeared to swerve his car to avoid a bollard.

Obituary

Mr. ELIJAH WIGHTMAN, who became undermanager of the Nettlesworth and Dean Drift Colliery (Co. Durham) nine years ago, has died at the age of 61.

The death has occurred of Mr. SAMUEL TULIP, former chief mechanical engineer at the Lambton engine works of the former Lambton, Hetton, & Joicey Collieries, Limited, of Newcastle-on-Tyne. He was 96.

The death has occurred of Mr. RICHARD W. BAMFORTH, the managing director of R. W. Bamforth & Company, Limited, manufacturers of tubular furniture and tube manipulators, etc., of Sowerby Bridge (Yorks).

The death has occurred of Mr. REGINALD JOHN MOORE WILKINS, for 30 years works superintendent of the electrical department of Mather & Platt, Limited, engineers, of Manchester. Mr. Wilkins, who was 64, went into partial retirement last Christmas.

Mr. ARCHIBALD T. ALEXANDER, company secretary of the engineering firm of John M. Henderson & Company, Limited, of Aberdeen, died last Friday, his 49th birthday. Mr. Alexander had been with the company for almost 27 years and company secretary for the past 10 years.

The death has occurred of Mr. DONALD WILFRID ATKINSON, former works manager at the Thornaby-on-Tees steelfoundries of Head, Wrightson & Company, Limited. He was 59. Mr. Atkinson was a member of the council of the Tee-side branch of the Institute of British Foundrymen.

Prof. WILLIAM EDWARD GARNER, FRS, who died last Friday, was a well-known authority on flames and explosions. He was born in 1889, for 27 years was Leverhulme Professor of Physical Chemistry at Bristol University, and during the last war led his department in research on explosives.

The death has occurred of Dr. JOHN FRASER CARTWRIGHT, works medical officer for Sir W. G. Armstrong Whitworth (Aircraft), Limited, Coventry, since 1944. Dr. Cartwright, who was 47, recently did considerable research into the hazards of beryllium dust before the opening of the firm's beryllium factory.

Mr. WILLIAM JOSEPH STEWART, who died on Saturday at the age of 81, started work at Boldon Colliery (Co. Durham) at the age of 10, and worked at the pit until he was elected to Parliament in the 1935 General Election. From then until 1945 he was Labour MP for the Houghton-le-Spring Division of Co. Durham.

The death has occurred of Mr. ALEXANDER HARRIS BROWN, a director for 41 years of the Bedford engineering firm of Motor Rail, Limited. Mr. Brown was elected a director soon after joining the firm, and remained one until his death, although ill-health caused him to retire from active participation in the business in 1945.

Mr. ARTHUR ANDERSON, who has died suddenly, was the founder of the Middlesbrough firm of electrical contractors, A. Anderson & Son. Mr. Anderson was a pioneer in the field of electrical contracting and during the last war undertook many important Admiralty contracts connected with the protection of ships from magnetic mines.

Mr. OSCAR RENDELL, a director of H. W. Kearns & Company, Limited, manufacturers of machine tools, etc., of Altrincham, since 1927, has died. For more than 51 years with the company, he was also a past president of the Manchester Association of Engineers. At the end of the war he was a member of the team which investigated the German machine-tool industry.

Dr. FRANCIS JONES, Lecturer in Mineralogy at the Imperial College of Science and Technology, London, from 1947 to 1958, died on Sunday. He was born in 1887 and from 1929 until 1947 was science master at St. Dunstan's College, London. He acted as geological consultant to Sir Alexander Gibb on the Kariba Dam and on other engineering projects in Persia, Ghana, and Upper Egypt.

Sir EDWARD CROWE, Comptroller-General of the Department of Overseas Trade from 1928 until 1937, died in Cairo on Tuesday. He was 82. Sir Edward was chairman of Croda, Limited, chemical and paint manufacturers, of Goole (Yorks), and a director of W. T. Henley's Telegraph Works Company, Limited, Marconi's Wireless Telegraph Company, Limited, and the English Electric Company, Limited.

The death has taken place of Mr. T. W. SIMPSON, production engineer of the North Western Gas Board and formerly, with the UK Gas Corporation, the largest gas holding company in the country. With UK Gas he was responsible, not only for the repairs and resetting of the carbonizing plant at all its 76 constituent companies scattered throughout England, Scotland, and Wales, but also for the construction of all new plant from the foundations upwards. He was 55.

Miners' Coal Problems in Smokeless Zones

ALLEGATION that the National Coal Board is not prepared to pay the full market price in lieu of concessionary coal to Yorkshire miners living in smokeless zones, was made last week by Mr. Fred Collindridge, Yorkshire Area secretary of the National Union of Mineworkers.

Local authorities in the area are being asked by the NUM to "delay action" on the Clean Air Act while negotiations are in progress with the NCB. Recently a Rotherham miner was convicted for burning coal in a smokeless zone. The miner said that concessionary coal was the only fuel he had.

Mr. Collindridge commented last week: "I think that Yorkshire is more affected than any other coalfield because of the compactness of the area and the large populations living in the midst of industrial undertakings. Our point of view for people who live in these smokeless zones is that there should be some form of alternative fuel for them. The miners would accept that.

"But the Coal Board is not disposed to meet that and the amount of payment given in lieu of concessionary coal is a figure well below the market price. It is taking unfair advantage of the position."

Big Rating Reductions for Immingham and Grimsby Docks

EVIDENCE showed that Grimsby docks had been running at a loss for many years past and that a valuation on a profits basis produced a substantial deficit, said Mr. C. E. W. Simes, QC, and Mr. H. P. Hobbs, the members of the Lands Tribunal, in London on Monday. They gave a reserved decision putting a rating assessment of nil on Grimsby docks and £32,500 net annual value on Immingham docks.

This followed an appeal by the British Transport Commission against a local valuation court's decision confirming a total assessment of £6,247 net annual value on Grimsby docks and £70,102 on Immingham docks.

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Another advantage of pneumatic tyres is that the loader can run over the air hose without the least risk of hose breakages.

High capacity. The capacity is dependent on the distance between the loading and dumping sites, but for instance, with a haulage distance of 70 ft., capacities of up to 55 cu. yds. of material per hour have been obtained.

Many ranges of application. Being independent of tracks the machine can operate over larger areas than track-bound loaders. It can be dismantled quickly and easily if shaft dimensions make transport difficult.

This machine is available in two versions, T2G and T2GH.

T2GH has a higher discharge height and is designed especially for dumping on conveyor belts.

Atlas Copco autoloaders are used throughout the world in various ranges of application such as cut-and-fill-stoping in ore mines, seam drifts in coal mines and for loading operations at the surface.

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Coal Exports Continue to Improve

ONE of the more cheerful aspects of the present coal situation is the considerable rise in exports for the first eight weeks of the year. So far total exports and bunkers amount to 913,000 tons, compared with 661,000 tons in the same period last year—a rise of 28 per cent.

Another indication that the industry is far from moribund is the steady increase in output per manshift. At 79.48 cwt. at the face it is over 5 cwt. better than the 1959 average. Overall, the figure of 28.32 cwt. compares with the 27.16 cwt. average for 1959.

Deep-mined output continues fairly constant at just over 3,900,000 tons, a drop of about 100,000 tons on a year ago. Open-cast output last week increased by 18,000 tons to 169,300 tons, but it is still well below the 241,700 tons of the comparable week in 1959.

There were 623,400 wage-earners on colliery books on February 27, against 674,800 on February 28, 1959, the numbers engaged at the coal face being 238,900 and 262,700, respectively. Total absenteeism (all workers) in the week ended February 27, was 15.61 per cent., compared with 17.20 per cent. in the week ended February 28, 1959. Output at the face was 3.974 tons and overall 1.416 in the week ended February 27, compared with 3.772 and 1.377 in the week ended February 28, 1959.

The following table gives (in tons) the output of saleable mined coal by division in the week ended March 5, and the tonnage lost through all causes (holidays, disputes, and go-slows):—

Division.	Week ended March 5, 1960.		Week ended March 7, 1959.
	Total output.	Tonnage lost.	Total output.
Scottish ..	372,000	4,800	375,700
Northern (N & C) ..	245,800	—	262,300
Durham ..	475,000	—	485,100
North-Eastern ..	841,600	21,600	876,200
North-Western ..	271,400	500	293,400
East Midlands ..	925,200	1,700	911,800
West Midlands ..	300,000	700	321,700
South-Western ..	419,800	4,000	427,900
South-Eastern ..	30,800	600	33,000
Great Britain—			
Deep-mined coal ..	3,881,300	33,900	3,987,100
Other deep-mined (including licensed mines) ..	50,900	—	54,700
Open-cast coal ..	169,300	—	241,700
TOTAL ..	4,101,500	33,900	4,283,500

HAULAGE RIDER'S DEATH "ANYBODY'S GUESS"

HAULAGE rider killed by a journey of trams at Wyllie Colliery (Mon), may have been tripped by the moving haulage rope, it was suggested at a Blackwood inquest. The jury returned a verdict of Accidental Death on Mr. Brinley Gordon Jervis (39), of Pontllanfraith.

The coroner, Col. D. J. Treasure, said it was anybody's guess how Mr. Jervis was knocked down. "I think it is absolutely safe to assume that nothing improper was being done. It appears that the journey was being operated properly and everything was in proper condition," he said.

Mining Fraternity Pays Tribute

MINERS representing every pit in the Yorkshire coalfield, together with national and Area officials of the National Union of Mineworkers and the National Coal Board were among the many who attended the funeral of Mr. Alwyn Machen at Barnsley on Monday. Mr. Machen, who was president of the Yorkshire Area of the NUM, died last week.

Many tributes have been paid to him and to his work for miners. Sir James Bowman, chairman of the NCB, said: "The industry has lost an able leader and the miners a sincere and courageous champion." "A courageous fighter" was how Mr. Eric Lockett, Area secretary of the National Association of Colliery Overmen, Deputies, and Shotfirers, described him, and Mr. Jack Bennett, secretary of the Miners' Permanent Relief Society, said: "He was a man who fought fearlessly for the welfare of the miner and his family."

Mr. Machen was a much-favoured candidate to succeed Mr. W. E. Jones as NUM president. The result of the ballot, announced yesterday (Thursday), revealed that Mr. Machen had topped the poll with 254,675 votes. The executive has decided to invite nominations for a new ballot in the week beginning June 20. Mr. Jones will continue in office until April 13, when the vice-president, Mr. Edward Jones, will take over until the result of the new ballot is known.

Paul Robeson at the annual brass band festival of the North-Eastern Divisional Coal Board Welfare Committee at Sheffield on Sunday added tribute. Mr. Robeson joined with the massed bands and male voice choirs in the hymn "Abide with Me" and dedicated the performance to Mr. Machen's memory.

The competition attracted a record entry of 38 bands in the three sections. Results:—Section I: 1 Carlton Main, Frickley (193); 2 Wharncliffe Silkstone (191); 3 Grimethorpe Colliery Institute (188). Section II: 1 Houghton Main (188); 2 Kippax Old Brass (186); 3 Brodsworth Main Welfare and Institute (183). Section III: 1 Rawmarsh (186); 2 Thurcroft Main (180); 3 Clayton West (178).

Trophies were presented by Mr. W. E. Jones, president of the NUM, Mr. W. H. Sales, chairman of the North-Eastern Divisional Coal Board, and Mr. F. Collindridge, Yorkshire NUM secretary.

In the brass band quartet championship of Great Britain at Oxford on Saturday, Crookhall Colliery (Co. Durham) was runner-up with 184 points—three points behind the winners, Rushden Temperance (Northants). Third was Grimethorpe Colliery "A" Quartet (Yorks), with 182 points.

NCB Denies Allegations of Residue Waste

ALLEGATIONS that the Durham Divisional Coal Board dumped hundreds of tons of saleable residue left by coal washing plants have been denied by the board. Mr. J. Smith, of West Hartlepool, complained that the NCB refused to sell the residue, which, he claimed, he could have sold to a Tees-side brickmaking firm as furnace fuel.

A board spokesman said it was incorrect to say that the residue was dumped and left for years. The board itself sold the residue, mainly to the Central Electricity Authority, after it had been allowed to dry out.

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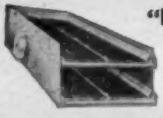

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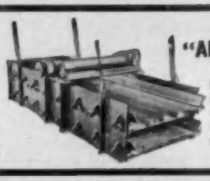

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Orders Placed

Sunderland Shipyard to Build at a Loss

TWO ships are to be built at a loss by the Sunderland shipbuilding firm of Bartram & Sons, Limited, in order to keep the yard employed until, according to a company statement, "there is some sign of a revival in shipping freights and in new orders." The statement adds that the contracts were won in the face of intense competition and that the recently negotiated reduction in shipyard hours would tend to increase labour costs and also the cost of all sub-contracted machinery and other fittings.

One of the contracts is for a 9,000-ton cargo liner for Buries Markes, Limited, of London, and the other for a 12,600-ton closed shelter deck cargo motor ship for Australind Steam Shipping Company, Limited, also of London. Machinery for both vessels will be supplied by the North Eastern Marine Engineering Company, Limited, Wallsend-on-Tyne. Bartram & Sons also announces that a contract for undisclosed owners has been brought forward on its order-book. The three ships will be delivered next year.

ANOTHER RUSSIAN ORDER for textile machinery worth £300,000 has been placed with Ernest Scragg & Sons, Limited, Macclesfield (Ches).

OWNERS OF Dent's Wharf, Middlesbrough, T. Roddam Dent, Limited, has placed an order with Stothert & Pitt, Limited, Bath, for three electric cranes each costing about £20,000.

The HUDDERSFIELD FIRM of Thomas Broadbent & Sons, Limited, has secured a £350,000 contract for the provision of centrifugal units for two new sugar factories which are to be supplied to Russia.

PRINTING EQUIPMENT worth about £650,000 has been ordered by Thomson Newspapers, Limited, from Witton-James, Limited, London, N.W.9, a subsidiary of the General Electric Company, Limited.

A CONTRACT worth about £700,000 for the design and construction of a materials handling and iron-ore sintering plant for the Skinningrove Iron Company, Limited, has been awarded to Head Wrightson Iron & Steel Works Engineering, Limited.

AIR-CONDITIONING EQUIPMENT worth about £100,000 has been ordered from P. M. Walker & Company (Halifax), Limited, by Gallaher, Limited, for its new tobacco factory in Belfast. Some of the production work will be undertaken by Aerosol-Turbo, Limited, a P. M. Walker subsidiary.

THE ENGLISH ELECTRIC COMPANY, LIMITED, has been awarded a contract by the Indian Railway Board for the complete electrical equipments, including control equipment and traction motors, for 10 3,600 h.p. 1,500 volt d.c. electric locomotives. They will be the first electric locomotives to be built in India.

CONTRACT WORTH £150,000 has been won by Weldall & Assembly, Limited, Stourbridge (Worcs), for the manufacture of the hanging weight fenders and retraction gear for a new jetty at Angle-Bay, Milford Haven, for the British Petroleum Company, Limited. The fenders will be ready for the opening of the jetty in June.

CONTRACT FOR TWO 30-mW steam turbine-generator sets for Lakeview power station on the shore of Lake Ontario, near Toronto, has been awarded by the Hydro-Electric Power Commission, of Ontario, to Associated Electrical Industries Export, Limited. The first machine is to be commissioned in September, 1963, and the second a year later.

EQUIPMENT FOR a polythene plant for Petroleos Mexicanos, the national oil company of Mexico, has been ordered from Simon-Carves, Limited, a member of the Simon Engineering Group. Simon-Carves will be responsible for the design and supply of the equipment. The plant, which is to be installed near Mexico City, will operate the ICI process.

A CONTRACT worth over £280,000 has been placed by Shell-Mex & B.P., Limited, with Albion Motors, Limited, Glasgow, subsidiary of Leylands Motors, Limited, for a large fleet of eight-wheeled Albion Caledonian tanker chassis. They will be fitted with 4,000-gallon aluminium tanks built by Alfred Miles, Limited, Gloucester, and Duramin Engineering Company, Limited.

JASON RESEARCH and training reactor has been ordered from Hawker Siddeley Nuclear Power Company, Limited, by the Dutch Nuclear Research Centre. The cost is about £50,000 and the order was secured in competition with two German firms. The reactor will be installed at Petten, north of Amsterdam, and should be operating in August. It will develop about 10 kW. and be used for experiments in nuclear physics, isotope production, and training purposes.

ORDER WORTH about £127,000 has been won by the Stanton Ironworks Company, Limited, Ilkeston, from the Argentinian Ministry of Public Works and Services, for the supply of 28-in. diameter spun iron pipes with socket and spigot and bolted gland joints. They will be used for extensions to the existing water supply systems in Argentina. First deliveries have already been made and manufacture of the whole order will have been completed within eight weeks.

SCOW in Port Talbot Docks Improvement Talks

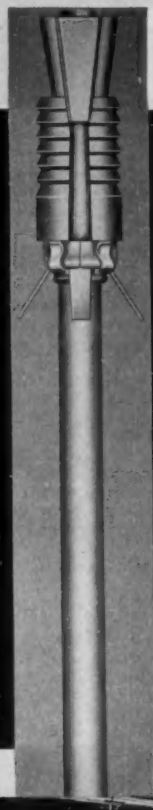
IMPROVEMENTS to Port Talbot docks to deal with larger iron-ore carriers were considered at a meeting between the British Transport Commission and the Steel Company of Wales, Limited, at Port Talbot last week. A joint statement afterwards read: "Various technical aspects of this complicated matter were discussed. It was agreed that further exploration should take place and that consultants should be engaged immediately to study the problem and make a report."

At present ships up to 10,000 tons can enter Port Talbot docks, where the locks have not been changed for more than 50 years. With a new entrance and breakwater pier, the docks could admit ships of up to 60,000 tons.

Stewarts and Lloyds Spends £11,000,000 on Modernizing

MORE than £11,000,000 was spent by Stewarts and Lloyds, Limited, on modernizing its Bilston works, said Mr. G. H. T. Macleod, the company's controller of general administration, at the sixth annual prize distribution for apprentices last Friday. He added that technological advances during the next 40 to 50 years would be quite beyond anything most people could comprehend.

The general manager, Mr. C. Macquarie, said that of the 280 young people in the firm who took examinations nearly 77 per cent. were successful. Apprentice of the year was John H. Carter and the Cutlers' Company prize went to Anthony Richmond.



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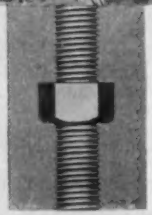

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Coalfield News

MINERS AT Barnsley Main Colliery (Yorks), who were on strike for four days over a wage dispute, returned to work on Wednesday.

CROOKHALL COLLIERY won a NCB North-West Durham Area first-aid competition last weekend. Second and third were Emma and Byermoor collieries.

COMBINED SERVICE of 20 miners who have retired from Balgonie Colliery (Fife) is 918 years. Presentations to the men, made by Mr. Andrew Hardie, colliery manager, coincided with the closing of the century-old pit.

EASINGTON COLLIERY (Co. Durham) has achieved a record by raising 24,130 tons of coal in a week. The previous best figure, last June, was 23,925 tons. Overall output per manshift is also a record at 35.10 cwt. of saleable coal.

AFTER 57 YEARS in the pits, Mr. T. Morris has retired from Great Mountain Colliery (Carmarthenshire). A presentation was made by Mr. J. G. Tait, general manager of No. 1 (Swansea) Area of the South-Western Divisional Coal Board.

PIT LADS at Barrow Colliery (Yorks) who came out on strike on Friday, wrongly supposing that a workmate had been dismissed, returned to work on Monday. A union official said: "It was all a misunderstanding. The lad was not sacked."

CHAIR MADE entirely of coal, which was recently sold at Sotheby's, is featured in the April issue of Mining Review, the NCB's newsreel. Other items include the visit of Sir James Bowman, chairman of the board, to Brynlliw Colliery, and a feature on weaving in a mining village.

TWICE "REPRIEVED" in the past four months, Meadows Colliery, Houghton-le-Spring, is to close this month after all. Of the 322 men employed there, 88 will become redundant, but efforts are being made to find them work within the industry. The remainder will be found jobs at nearby pits.

GEORDIE, A SIX-YEAR-OLD pit pony, sacked by the National Coal Board because he refused to work, has become the mascot of the 17th Battalion, The Parachute Regiment (9th DLI), TA, as a reminder of the Airborne Force's emblem, Pegasus, and of Durham's mining traditions. Geordie will be handled by Pte. John McDonough, a worker at the Rising Sun Colliery, Wallsend.

DISMISSAL NOTICES have been handed to 150 miners at Harrington No. 10 and St. Helens collieries, Workington. Another 110 are to be transferred to Solway Haig and Walkmill collieries, where there will be immediate work for as many faceworkers "as care to apply," according to a spokesman for the Cumberland Area of the Northern (N&C) Divisional Coal Board. Other redundant men will be offered work as vacancies occur.

COAL AND COKE shipments from South Wales ports last week totalled 54,435 tons, 6,605 tons less than the previous week, but 4,694 tons up on the corresponding week of last year. Shipments from the various ports (with the comparable 1959 figures in parentheses) are as follow:—Newport, 8,468 (8,062) tons; Cardiff, 11,635 (4,177) tons; Penarth, 3,921 (6,396) tons; Barry, 14,796 (11,824) tons; Port Talbot, 1,197 (2,492) tons; Swansea, 14,418 (16,790) tons.

PLANS FOR 350 miners' houses to be built by the Coal Industry Housing Association on the site of the former Clipstone Camp have been approved by Mansfield Woodhouse Urban Council (Notts). The houses, it is stated, are urgently needed to help coal production at the NCB's No. 2 (Edwinstowe) Area of the East Midlands Divisional Coal Board and would be mostly for miners transferred from other districts in the division where coal seams are becoming exhausted.

PART OF Greenrigg Colliery, Fauldhouse (Lanarkshire), closed last Friday, but two NUM officials, who were on the redundancy list of 127 men, will now stay on at the pit for three months longer. They are to continue in their jobs as strippers until June, when a further 318 men will be paid off, to deal with outstanding union matters. The decision to retain the NUM branch secretary, Mr. Robert Moore, and the president, Mr. Thomas McIlwaine, was taken by the miners themselves.

ASSISTANCE OF trade unions in submitting a case to the National Coal Board for the restoring of the port's coal shipping business is to be sought by Amble (Northumberland) Town Development Committee. The port's trade has seriously declined in recent years and Mr. Leslie Graham, chairman of the Northern (N&C) Divisional Coal Board, has stated that he cannot take an optimistic view of the port's future unless there is an improvement in coal exports suitable for shipment from Amble.

FOLLOWING CANADIAN UNION CHARGES that hundreds of former Scottish coal miners are getting jobs in the Ontario gold mines at the expense of Canadian workers, the Canadian Government is reported to have ordered an investigation. Commenting on the protests, Mr. Abe Moffat, president of the Scottish Area of the NUM, said: "Two years ago I warned Scottish miners about going to Canada because of the dying coal industry over there and the unemployment. I do not like to see men taking other men's jobs."

STAFF DIRECTOR of the North-Eastern Divisional Coal Board, Mr. L. Marsh, speaking at a social gathering in the No. 2 (Doncaster) Area, said the coal industry had many problems, but he thought that in Yorkshire they had bright prospects and, given the co-operation they had had in the past, they would continue to have a successful future. He told about 600 clerical staff, assistant engineers, foremen, and specialist grades employed at Area and divisional level that an efficient and happy staff was one of the best assets.

PIT SAFETY was the theme of a weekend conference at Porthcawl of 60 South Wales miners, entrusted with the special task of ensuring the safety of their own pits. For the past 15 months, these specially-selected miners have been studying a correspondence course on the subject arranged by the South Wales Area of the National Union of Mineworkers. Among the speakers was Mr. Keith Mason, of Pontypool, head of the Department of Engineering, Production, and Safety of the NUM. The Area secretary, Mr. D. D. Evans, presented certificates to 35 of the miners.

FALL OF COAL KILLED SCOTTISH MINER

A MINER was killed by an underground fall of coal at Nellie Colliery, Cowdenbeath (Fife), while a colleague was fetching props to support the stent he was working at, it was stated at a Dunfermline inquest last week. The jury returned a formal verdict on Mr. Robert Campbell (36), of Lochgelly.

Mr. John F. Thom, colliery shotfirer, said that the stent at which Mr. Campbell was working was too high. There was a scarcity of props that day and Mr. Campbell asked for more. Witness had sent a man to fetch some when the accident occurred. Mr. Thom said he thought it safe enough for Mr. Campbell to be working where he was before further props arrived.

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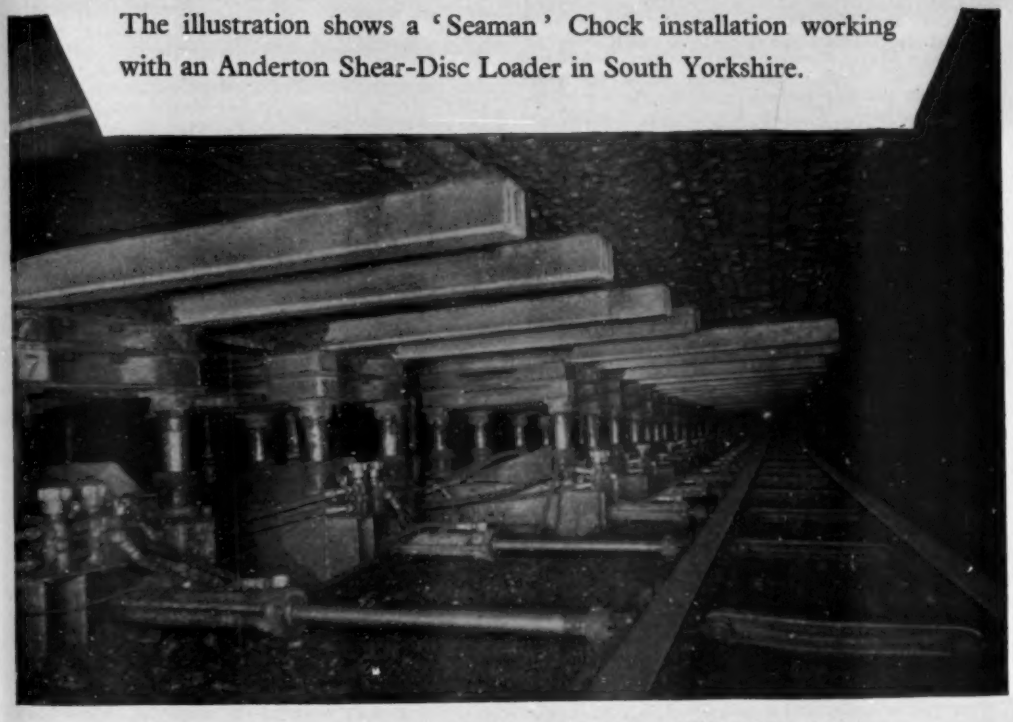

With acknowledgements to N.C.B. N.E.Div. No. 3 Area

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G.3.

News in Brief

SUITABLE SITES for large coal-fired power stations for the Central Electricity Generating Board, have been found at Holme Pierrepont, near Nottingham, and at West Burton (Notts).

ABOUT 600 TONS of steel were supplied and fabricated by the Lilleshall Company, Limited, of Oakengates (Salop), for the structure of the new luxury Bermudian Hotel, in Hamilton, Bermuda.

RECORD CAPITAL EXPENDITURE of $159,000,000 is planned by the Republic Steel Corporation, of Chicago, US, as part of a five year $375,000,000 programme designed to improve efficiency and versatility.

AGREEMENT HAS been reached between the Cologne firm of J. Meissner and Leonard Smith (Engineers), Limited, London, S.W.1, for mutual support throughout the world in the sale of their formaldehyde processes.

PRODUCTION OF STEEL in the US this week is estimated by the American Iron and Steel Institute at 2,654,000 tons, compared with 2,690,000 tons (revised) last week, and 2,556,000 tons in the equivalent week last year.

WINSTON METAL FABRICATIONS, LIMITED, Teddington (Middx), will, during the spring, move to larger premises in the new extensions of the factory of the parent company, Winston Electronics, Limited, at Shepperton (Middx).

ROLLING MILL recently brought into production by Sociedad Española de Construcciones Electro-Mecánicas, Córdoba, Spain, was constructed by Schloemann, AG, of Düsseldorf. The plant will manufacture copper rod and rounds.

A WESTERN AREA sales and service depot for the garage equipment division of Laycock Engineering, Limited, Sheffield, was opened on Thursday of last week at Kingswood, Bristol, by the chairman of the company, Mr. H. E. Hill.

ABERDEEN CORPORATION'S planning committee has approved an application by John M. Henderson & Company, Limited, manufacturers of aerial and cable ropeways, engineers, and ironfounders, to extend its King Street ironfoundry.

A CONSORTIUM is to be formed from US and Turkish interests for the building of Turkey's second steelworks. It will consist of the American firms of Koppers, Blaw-Knox, and Westinghouse and the two Turkish banks, Sümerbank and Ischbank.

NEW COMMERCIAL VEHICLE factory at Ellesmere Port, on the south shore of the river Mersey, to be built by Vauxhall Motors, Limited, Luton, will have an area of more than 2,500,000 sq. ft. and will eventually employ about 7,000 people.

NEARLY 2,000 EMPLOYEES at the Doncaster works of the International Harvester Company of Great Britain, Limited, who have been on strike over pay grievances, returned to work yesterday (Thursday). Talks are to be held with the management.

TWO 200 FT.-HIGH slagheaps overlooking the village of Trowell (Derbyshire) have been sold by the Stanton Ironworks Company, Limited, to a firm of industrial contractors. The "hills" will be removed and the ground restored to its natural contours.

INCREASE OF 3,000 metric tons in the contingent for tinplate imported from dollar-area countries via Salerno announced by the Italian authorities brings the tinplate imports of this type from 15,000 to 18,000 metric tons for the current year.

THE 120 WELDERS employed at the Derby works of International Combustion, Limited, who went on strike on Thursday of last week returned to work on Monday pending negotiations, between management and union. They went on strike after the dismissal of 60 of their mates who were on strike at High Marnham (Notts), where Europe's largest power station is being constructed.

SUDAN'S PREMIER, General Abboud, attended the formal handing-over ceremony at Khartoum on Tuesday of the country's first diesel locomotive, built by the English Electric Company, Limited. The company expects to deliver 14 more locomotives to the Sudan soon.

FIRST EXPORT ORDER for the Dowlais foundry of the Guest Keen Iron & Steel Company, Limited, was for ingot moulds, worth about £80,000 for an American customer. Half the consignment was shipped at Cardiff on Monday, and the remainder will go in two or three weeks' time.

HEATING at Newcastle-upon-Tyne's new town hall will be possible by either coal-tar fuel, developed by the National Coal Board, or by fuel oil. Although, at £5,400 a year, coal-tar fuel will cost £1,100 more than fuel oil, the City Council intends to use it to help the coal industry.

TWO DUTCH STEELMAKERS, Koninklijke Nederlandsche Hoogovens en Staalfabrieken N.V. and Breedband N.V., both of Ijmuiden, are to increase their raw steel output by a total of 1,900,000 metric tons per year and to expand their production of cold-rolled thin sheet and galvanized sheet.

NEWLY INSTALLED £9,000 nitriding plant, consisting of a 56 kW. cylindrical furnace, at the Elandsfontein headquarters of Leyland Albion (Africa), Limited, gives crankshafts twice the resistance to fatigue and two and a half times the hardness of a normally hardened and tempered steel shaft.

INVESTIGATIONS are being made by the Pressed Steel Company, Limited, Cowley (Oxon), into the possibility of opening a new factory in or near Jarrow in an area of fairly widespread unemployment. It is understood that the company has acquired some big long-term bodybuilding contracts and is likely to spend £20,000,000 to £25,000,000 in the next few years.

TO CELEBRATE 50 years' association with Plymouth, Acheson Colloids, Limited, makers of colloidal graphite, etc., on Wednesday presented to the city a silver "standing salt," a traditional piece of ceremonial plate. The presentation was made to the Lord Mayor at a civic reception, by Mr. H. A. Acheson, of New York, president of the international Acheson organization.

P. G. Engineering Wins Oversea Plant Orders

CONTRACTS for process plant from Canada and India, worth more than £1,250,000, have been awarded to P.G. Engineering, Limited, of Stockton-on-Tees, a member of the Power-Gas Group. The company has already reported the receipt of orders worth £9,300,000 in the first four months of its current financial year.

The Canadian order awarded by Brockville Chemicals, Limited, to P.G. Engineering and its associate, Power-Gas, Canada, Limited, of Montreal, is for the design and construction of a hydrogen plant for a new works now being built at Maitland, Ontario. The plant will cost about $1,800,000 and should be completed early next year.

The second order, from Fertilisers & Chemicals, Limited, Travancore, South India, is for a Texaco partial oxidation gasification plant to produce carbon monoxide and hydrogen.

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Board Changes

GLACIER METAL COMPANY, LIMITED—Mr. T. Collier, general manager of the Kilmarnock factory, has been appointed to the board.

BELL PUNCH COMPANY, LIMITED—Mr. George H. Allen, Mr. Bernard C. Bell, and Mr. Richard Walter have been elected to the board.

INSPECTING ENGINEERS, LIMITED—Mr. M. F. Barnes has been appointed managing director and Mr. B. H. T. Olver, a founder member of the company, has resigned.

GUEST, KEEN & NETTLEFOLDS (MIDLANDS), LIMITED—Mr. C. C. Birch, a director of the subsidiary, L. H. Newton & Company, Limited, has been appointed to the board.

VENNER, LIMITED—Mr. Edward Tauchert has been elected chairman in the place of the late Mr. Arthur A. Rowse. He will continue as managing director of the company and its subsidiaries.

AIRCRAFT STEEL STRUCTURES, LIMITED—Mr. R. G. Tolley is to join the company, which is a subsidiary of Simms Motor & Electronics Corporation, Limited, as a director and general manager.

BRITISH CHROME & CHEMICALS, LIMITED—Mr. W. H. Coates has been appointed a joint managing director of the company, which is a member of the Associated Chemicals Companies, Limited, group.

ARTHUR LEE & SONS, LIMITED—Mr. John M. Shaw has been appointed to the board and Mr. G. Wilton Lee and Mr. Arthur M. Lee, directors of the company, have joined the board of John Shaw, Limited.

ALLIED IRONFOUNDERS, LIMITED—Mr. Guy Savile Stevens, managing director, is appointed chairman on the retirement at the end of March of Mr. William Hogg Smith. Mr. Smith has been in the industry for 61 years.

MATHER & PLATT, LIMITED—Mr. William L. Mather, director in charge of the general machinery and food machinery departments, will be elected chairman of the company on April 1, in the place of Mr. L. E. Mather, who is retiring.

BRITISH GLUES & CHEMICALS, LIMITED—Mr. Harold J. Coates is to relinquish his managing directorship after 40 years in that office, but he will continue as chairman. He will be succeeded on March 31 by Mr. Israel Harris Chayen, at present assistant managing director.

SHARDLOW MICROMETERS, LIMITED—Mr. J. C. Proudfoot has been appointed chairman and Mr. H. Mitchell managing director of the company which is a subsidiary of Ambrose Shardlow & Company, Limited. Mr. A. Seagrave and Mr. J. W. Jackson have been appointed to the board.

HATTERSLEY (ORMSKIRK), LIMITED—Mr. A. Nocton and Mr. R. Stephen Wild have been appointed to the board. Mr. W. Kinsey is retiring from executive office and from the board, and Col. C. A. Hunt is retiring from the board, but will continue as a director of the subsidiary company, Beck & Company (Meters), Limited.

STONE MARINE ENGINEERING COMPANY, LIMITED—In view of the commitments in the Stone-Platt Industries group, Mr. J. A. Morton has resigned as joint managing director, but remains on the board responsible for marine sales of Stone-Valor boilers and Stone's non-ferrous nails and rivets. Mr. C. G. Parsons has joined the board and has been appointed general manager.

ON BEHALF of the German manufacturer, Bergkamen, Cyclo Chemicals, Limited, is to sell aluminium alkyl chemical compounds in the UK.

Coal Stocks Position

DETAILS of coal stocks as at February 27, 1960, compared with those available at February 28, 1959, are given in the appended table issued by the Ministry of Power.

Figures in parentheses, mainly calculated on the basis of requirements during the winter, indicate the total weeks which the tonnage in stock would last.

Week ended:—	Feb. 27, 1960.	Feb. 28, 1959.
	Thous. tons.	Thous. tons.
Distributed stocks		
Public-utility undertakings—		
Gas	1,912 (3.6)	2,266 (4.2)
Electricity	5,299 (4.7)	6,311 (6.0)
Railways	382 (1.9)	586 (2.8)
Coke ovens	1,460 (2.8)	1,370 (2.8)
Industrial consumers—*		
Iron and steel	219 (1.9)	226 (2.0)
Engineering and other metal industries	281 (3.1)	306 (3.4)
Other industries	1,708 (3.0)	1,801 (3.2)
TOTAL INDUSTRIES	2,208	2,333
Merchants' stocks—		
(*a*) House coal	806	878
(*b*) Anthracite and boiler fuel	142	96
Miscellaneous (estimated)	246	350
TOTAL DISTRIBUTED STOCKS	12,455	14,190
Undistributed stocks—		
At collieries (on ground and in wagons)	26,551	14,112
At open-cast sites	6,533	5,694
TOTAL UNDISTRIBUTED STOCKS	33,084	19,806

* Excluding stocks held by the smaller consumers of less than 1,000 tons per annum.

Atomic Groups Decide Not to Collaborate

PLANS for collaboration on future reactor systems between the General Electric-Simon Carves Atomic Energy Group, Limited, and Atomic Power Constructions, Limited, have been dropped. An announcement last weekend said: "It was not proved possible to agree on the scope and functions of a new organization to give effect to these arrangements, and negotiations between the two groups have, therefore, been terminated."

In September it was stated that agreement had been reached between the two groups to collaborate in the design and construction of nuclear power stations in the UK and that the two companies had agreed to submit joint tenders for Dungeness and further stations in the British nuclear programme.

CONTRACTS FOR the construction of a large dry dock at Great Harbour, Greenock, will be placed in the near future, says Mr. A. H. White, deputy chairman of Lithgows, Limited, ship builders and repairers, of Port Glasgow, and a director of the Firth of Clyde Dry Dock Company, Limited. The dock is expected to be ready in 1963.

R W G

This is the lower half of a gas turbine cylinder for a 2,500 kW gas turbo-alternator now running in a Midland steel works, converting the heat in waste blast-furnace gas into useful work. The provision of economical power is our business; and since we manufacture most of the main equipment for a power station such as boilers, turbines, alternators, condensers, feed heaters, cooling-water strainers, we are well equipped to design and carry through schemes for the efficient utilisation of any fuel.

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and at 58 Victoria Street, London, S.W.1, 59 Mosley Street, Manchester and 75 Buchanan Street, Glasgow. RW.51

Increases of Capital

WATLING STREET TOOL & GAUGE COMPANY, LIMITED, Markyate (Herts), increased by £65,000, in £1 ordinary shares, beyond the registered capital of £10,000.

MORELAND HAYNE & COMPANY, LIMITED, millwrights, etc., of London, E.C.1, increased by £150,000, in £1 ordinary shares, beyond the registered capital of £150,000.

DORAN ENGINEERING COMPANY, LIMITED, Wednesfield, Wolverhampton, increased by £20,000, in £1 unclassified shares, beyond the registered capital of £20,000.

W. E. SYKES, LIMITED, gear specialists, etc., of Staines (Middx), increased by £300,000, in 10s. "B" non-voting ordinary shares, beyond the registered capital of £900,000.

GAILORD EDWARDS & COMPANY, LIMITED, mechanical and general engineers, etc., of Nottingham, increased by £20,000, in £1 ordinary shares, beyond the registered capital of £5,000.

AVERY-HARDOLL, LIMITED, manufacturers of pumps, tanks, reservoirs, etc., of Chessington (Surrey), increased by £200,000, in £1 ordinary shares, beyond the registered capital of £100,000.

VERITYS (MAXLUMS), LIMITED, manufacturers of electrical lamps and instruments, etc., of Birmingham, increased by £99,900, in £1 ordinary shares, beyond the registered capital of £100.

BAXTER, FELL & COMPANY, LIMITED, iron, steel, mineral, and hardware merchants, etc., of London, E.C.3, increased by £240,000, in £1 ordinary shares, beyond the registered capital of £60,000.

GEORGE RUSHWORTH & SON, LIMITED (formerly J.G.G. (Colne), Limited), engineers, steel merchants, etc., of Colne, increased by £29,410, in £1 ordinary shares, beyond the registered capital of £100.

H. FORDSMITH, LIMITED, engineers, etc., of Manchester, increased by £40,000, in 1,000 7½ per cent. cumulative preference and 30,000 ordinary shares of £1 each, beyond the registered capital of £10,000.

RUSTON-BUCYRUS, LIMITED, manufacturers of excavating machinery, etc., of Lincoln, increased by £2,000,000, in 1,000,000 "R" ordinary and 1,000,000 "B" ordinary shares of £1, beyond the registered capital of £4,000,000.

PEGLERS, LIMITED, brass, iron, copper, and aluminium founders, etc., of Doncaster (Yorks), increased by £842,000, in 1,440,000 "A" ordinary and 1,928,000 "B" ordinary shares of 5s. each, beyond the registered capital of £920,000.

HEPWORTH IRON COMPANY, LIMITED, Hazlehead, near Sheffield, increased by £577,000, in 5s. ordinary shares, beyond the registered capital of £23,000. Converted into a public company on September 10, 1959. The 2,300 ordinary shares of £10 each have been sub-divided into 5s. shares.

Recent Wills

MILBURN, F. W., former colliery agent, of Mount Vale, York £11,834

WRIGHT, WILLIAM, for 25 years manager of Harworth Colliery (Notts) £3,362

ROYCE, HARRY, former buyer of Rolls-Royce, Limited, and an underwriting member of Lloyd's £75,025

ARMSTRONG, SIDNEY, former manager of R. B. Harrison & Sons, Limited, shiprepairers, of Gateshead (Co. Durham) £1,887

CARTER, GEORGE, engineer and managing director of Ada (Halifax), Limited, washing machine manufacturers £181,534

THOMPSON, A. G., former secretary, dry docks department (Wallsend), of Swan, Hunter, & Wigham Richardson, Limited £2,189

WOODHOUSE, HENRY, chairman of Samuel Woodhouse & Sons, Limited, chainmakers, dropforgers, etc., of Cradley Heath (Staffs) £114,339

DUFF, G. A., formerly chief engineer of Joseph Crosfield & Sons, Limited, chemical manufacturers, of Warrington £74,519

DAY, G. E. I., formerly a director of Day, Summers & Company, Limited, engineers and shipbuilders, which closed down in 1928 ... ... £4,890

ORMEROD, D. E., works manager and a director of the Patent Automatic Feeding Machine Company, Limited, woollen machinery manufacturers, of Rochdale £9,595

LONGSTAFF, ALD. RICHARD, a member of the Tyne Improvement Commission, former Mayor of South Shields, and for more than 50 years an employee at Harton Colliery, South Shields £1,257

BRIAN, WILFRED, chief designer for Brook Motors, Limited, Huddersfield, and former president of the Huddersfield Engineering Society £14,309

Ore Chartering

TONNAGE does not offer freely from the Mediterranean area and rates are more or less unchanged. Melilla/Rotterdam has paid 18s. for early loading, similar rate also to one port Holland for a 9,800-tonner March shipment, and Suda Bay/Holland reports 26s. for 9,500 tons, March 5-15, on gross terms. There has been a resumption in chartering from Poti to the UK, 9,500 tons of manganese having been fixed to Birkenhead for March 5-15 at 37s. 6d. and 6,500 tons to the Continent, also March, at 31s., on f.i.o. basis. The Indian ore market to the Continent has been fairly active, with rates varying according to size, discharging port and position.

Bauxite from Itea to the river Thames paid 33s. for 4,400 tons, April 1-30, with the option of Aspra Spitia at 34s., and tonnage is required from Toulon to South Wales for March. Small tonnage has been taken from Barcelona to the UK, with bulk potash for May shipment at 40s. f.i.o.t.

There is no particular activity noted in the chartering of tonnage for phosphate, although Casablanca/Holland reports 20s. for 8,100 tons, March, and a 4,000-tonner has been fixed from Casablanca to Hull, also March loading, at 37s. 3d. Sulphur has been fixed from Galveston, Port Sulphur, or Beaumont to east coast UK for March/April loading at 52s. 6d. for about 9,000 tons, and, here again, interest is maintained.

Ferro-alloy Prices

(Per ton, unless otherwise stated, delivered)

FERRO-SILICON (6-ton lots and over)—45 per cent. Si, £41 10s. to £44, scale 15s. per unit, lumpy; 75 per cent. Si, £57 to £62 10s., scale 15s. per unit, lumpy.

FERRO-VANADIUM—50/60 per cent., 22s. 6d. per lb. of V.

FERRO-MOLYBDENUM—65/70 per cent., carbon-free, 12s. 10d. per lb. of Mo.

CALCIUM MOLYBDATE—12s. 4d. per lb. of Mo.

MOLYBDIC OXIDE BRIQUETTES—11s. 10d. per lb. of Mo, delivered United Kingdom.

FERRO-BORON—23/25 per cent., 7s. 6d. per lb.

FERRO-TITANIUM—20/25 per cent., 2-3 per cent. Cu, £250; 38/40 per cent., commercially carbon-free, £287.

FERRO-TUNGSTEN—80/85 per cent., 12s. per lb. of W.

TUNGSTEN METAL POWDER—98/99 per cent., 15s. per lb. of W.

FERRO-CHROME (6-ton lots and over, lumpy)—4/6 per cent. C, £78 10s. to £82 10s., basis 60 per cent. Cr, scale 26s. to 28s. 6d. per unit; over 6 per cent. C, £77 to ££80 10s., basis 60 per cent. Cr, scale 26s. to 28s. 6d. per unit; max. 2 per cent, C*, 1s. 8d. to 1s. 11d. per lb. Cr; max. 1 per cent. C*, 1s. 8½d. to 1s. 11½d. per lb. Cr; max. 0.15 per cent C*, 1s. 9½d. to 2s. 0½d. per lb. Cr; max. 0.10 per cent. C*, 1s. 9½d. to 2s. 0½d. per lb. Cr; max. 0.06 per cent. C*, 1s. 10½d. to 2s. 1d. per lb. Cr.

METALLIC CHROMIUM—98/99 per cent., 6s. 10d. per lb.

METALLIC MANGANESE—94/96 per cent., carbon-free, £275; 96/98 per cent., £285.

FERRO-COLUMBIUM—65/67 per cent., Cb+Ta, 19s. 9d. per lb., Cb+Ta.

FERRO-MANGANESE (home)—78 per cent., £63 10s.

* *Average 68-70 per cent. Cr.*

Non-ferrous Metal Prices

(Delivered, unless otherwise stated)

Copper—Solid-drawn tubes, 2s. 5½d. per lb.; rods, 274s. per cwt. basis; 20 s.w.g., 309s. per cwt.

Brass—Solid-drawn tubes, 2s. 0¾d.; sheets up to 10 w.g., 218s. 9d. per cwt.; wire, 2s. 10¼d.; rolled metal, 218s. 9d. per cwt.

Lead Sheets, etc.—Sheets, £112 15s.; pipes, £115 per ton.

Zinc Sheets, etc.—Sheets, 15 g. and thicker, ex works English destinations, £123 5s.; rolled zinc (boiler plates), ex works, all English destinations, £121; zinc oxide (Red Seal), d/d buyers' premises, £100 per ton.

Other Metals—Nickel, £600. Aluminium ingots, £186. Antimony, English, 99 per cent., £190. Quicksilver, ex warehouse, £70 10s. to £71. Bismuth (per lb.), 16s. nom. (1-ton lots). Cadmium, 10s. per lb. Magnesium ingots (per lb.), 2s. 2¼d. to 2s. 3d., notched bar 2s. 9½d., powder 6s. 1d. Platinum, per oz. (troy), £30 5s.